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INSTITUTE FOR DEFENSE ANALYSIS STUDY OF V–22 OSPREY

HEARING

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

SPECIAL HEARING

Printed for the use of the Committee on Appropriations

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INSTITUTE FOR DEFENSE ANALYSIS STUDY OF THE V-22 OSPREY

THURSDAY, JULY 19, 1990

U.S. SENATE,
SUBCOMMITTEE ON DEFENSE,
COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 9 a.m., in room SD-192, Dirksen Senate Office Building, Hon. Daniel K. Inouye (chairman) presiding.

Present: Senators Inouye, Bumpers, Lautenberg, Stevens, Garn, Kasten, D'Amato, Specter, and Gramm.

INSTITUTE FOR DEFENSE ANALYSIS

STATEMENT OF DR. L. DEAN SIMMONS, RESEARCH STAFF, SYSTEM EVALUATION DIVISION, INSTITUTE FOR DEFENSE ANALYSIS

ACCOMPANIED BY DR. DAVID L. RANDALL, DIRECTOR, SYSTEM EVALUATION DIVISION, INSTITUTE FOR DEFENSE ANALYSES

OPENING REMARKS OF SENATOR INOUYE

Senator INOUYE. The subcommittee meets this morning to discuss the future of Marine Corps aviation during a time of increasing fiscal constraints on defense spending. Today's hearing focuses on the V-22 tilt rotor aircraft, a program which has been killed by the Secretary of Defense but resurrected by Congress.

It is an understatement to say that the Secretary's decision to terminate the V-22 has been controversial. The issues are complex and the decisions Congress will make on the investment or savings amount to billions of dollars. The V-22 proponents say that the aircraft represents a revolutionary technology, a technology with military and civilian aviation benefits which justify the program costs. Opponents suggest that these benefits are not commensurate with the amount of scarce resources the V-22 would divert from the other higher priority defense programs.

The Marine Corps clearly wants the V-22 despite its official position to support the President's budget. The Defense Secretary is just as adamant in his position to terminate the program. So we are holding this hearing this morning to shed some light on both sides of this debate.

The witnesses today are the Honorable David Chu, Assistant Secretary of Defense for Program Analysis and Evaluation, and Dr. L. Dean Simmons of the Institute for Defense Analyses. Dr. Simmons

was the project leader for an IDA special study entitled "Assessment of Alternatives for the V-22 Assault Aircraft Program." Gentlemen, we look forward to your testimony. After any opening remarks by members of this subcommittee we shall first hear from Dr. Simmons. Secretary Chu will testify after that.

Senator Specter.

STATEMENT OF SENATOR SPECTER

Senator SPECTER. Thank you very much, Mr. Chairman.

To begin with, Mr. Chairman, I thank you for convening this special hearing. I believe it to be necessary as the testimony presented by the military has very forcefully supported the V-22 Osprey. General Gray, head of the Marine Corps, testified as to some of the objections and called them totally ridiculous.

An independent report by the Institute for Defense Analyses has categorically stated that the V-22 Osprey is vastly superior to any alternative, and it is well within the budget constraints. The Department of Defense early opposed the Osprey, and has candidly maintained this position despite an overwhelming case in its favor.

The central point of our inquiry here today is to focus on the facts. What can the Osprey do?

Mr. Chairman, I would suggest that there is a very important subsidiary question in terms of the procedures and, really, the good faith of the Department of Defense in terms of opening this process to the Congress.

Last year, both houses of the Congress mandated an independent study: a study to determine the facts. As the process has gone forward, there have been reports of a preliminary conclusion not made available to the Congress. There were meetings on April 16 with no congressional participation. There was strong insistence in the Congress on getting access to the report which was finally made available under strong pressure by this Senator, talking to Dr. Chu and finally to the Secretary of Defense, on Friday when we left for the Fourth of July recess, which has the unmistakable imprint of trying to delay it as long as possible until 535 Members of Congress have left town.

The central question here is the quality of the plane. I think that there is absolutely no basis for any contention that this is a parochial issue. Obviously, Senators from Pennsylvania and Texas are going to take a special look because our States are so heavily involved, but this is a matter of national defense. The very distinguished chairman of this subcommittee has been very forceful on this issue, and all it can do is fly to Hawaii.

The ranking member of this subcommittee said last year that he would not vote for an appropriations bill that did not contain the V-22 Osprey. Now what is a Pennsylvania Senator supposed to do? Absent himself from the proceedings? This is not a matter of Pennsylvania or Texas or parochialism. This is a matter of national defense. We know that we are now going into a era in which B-22's and long-range missiles are less important. We know we have problems in Panama. We know we have problems in the Persian Gulf. We know we need flexibility.

I reviewed the matter again yesterday afternoon with General Pittman, who originally opposed the V-22. Now he calls it absolutely indispensable. He says we can document that had we had the V-22 in Panama, we would have saved lives. Why save lives? Because the V-22 can land like a helicopter after flying long distances as a fixed-wing plane. You do not have to jump people on parachutes. There is nothing more important than saving lives when we ask our military personnel to take action in the national interest.

If I sound just a little bit perturbed, Mr. Chairman, it is because I am. I think it is really important to have Dr. Chu and Dr. Simmons head to head addressing the facts. All we want are the facts and let the chips fall where they may. I am satisfied after reviewing a 1,200-page report that the facts are overwhelmingly in support of the V-22, and that any fairminded interpretation or conclusion will support the V-22.

Thank you, Mr. Chairman.

Senator INOUYE. Thank you very much, Senator Specter.

Now, Dr. Simmons.

SYNOPSIS OF STATEMENT

Dr. SIMMONS. Mr. Chairman, members of the committee, I am quite pleased to appear before you this morning in connection with IDA's assessment of alternatives for the V-22 assault aircraft program. The Institute is one of our federally funded research and development centers. We carry out studies and analyses for the Office of the Secretary of Defense, the Joint Staff, the unified commands, and the Defense agencies.

ASSESSMENT OF ALTERNATIVES

The V-22 assessment that I will be reporting on this morning was conducted at the request of the Office of the Secretary of Defense, which, as you know, had responsibility for the study that was directed by the Congress last year.

The detailed results of our study have been documented in a five-volume draft report. Copies of that report have been forwarded by the Secretary of Defense to the Senate Appropriations and Armed Services Committees and to the corresponding committees of the House of Representatives. The report is now being reviewed within the Department of Defense by the steering group established for our study, and after consideration of comments that they may provide, IDA will publish a final version of the study.

Later this morning I will be presenting a short briefing of our findings. In my opening statement I would like to discuss two of the key considerations that relate to the cost of the aircraft: the overall cost effectiveness of the alternative fleets measured over a 20-year period that we used as the principal basis for our conclusions, and the difference in the near-term costs for the alternative fleets.

PROCESS LEADING TO STUDY RESULTS

Before doing that, though, I would like to take a few minutes to describe the process that we used at IDA to arrive at our study re-

sults. To conduct a study of this scope, we need access to a considerable amount of information, detailed data related to the performance and costs of the alternative aircraft, descriptions of how our various military forces would employ the aircraft in combat situations, and estimates of the performance of the weapons that might be used against the aircraft by potential wartime enemies.

To obtain this information we met frequently with the three military services that have proposed to use the V-22 Osprey and the assault helicopters, the Marine Corps, the Navy, and the Air Force. We also had frequent and detailed discussions with the contractors that would build the different aircraft—Bell, Boeing, and Sikorsky—in the United States and Aerospatiale, Agusta, and Westland in Europe. We had numerous discussions with representatives from our intelligence community to obtain information on potential threat systems.

As one might expect, the study has been subject to considerable oversight and review both by IDA and by the Department of Defense. As is the case with every major study conducted at IDA, a review committee was established by IDA to provide guidance and rigorous review of the technical and operational inputs and the analytical methods. The review committee was composed of knowledgeable individuals from outside IDA and appropriate members of IDA's management and research staffs. The committee was chaired by Dr. David Randall, Director of IDA's System Evaluation Division which is the component of IDA where I work. Dr. Randall has accompanied me today and will be available to help answer any questions that you may have.

STEERING COMMITTEE

The Department of Defense provided guidance and direction to the study through a steering committee that included representatives from a number of OSD staff elements, in particular those responsible for program analysis and evaluation, for overseeing the development and acquisition of tactical combat systems, for tests and evaluation, and for estimating the costs of future military systems.

In addition, the steering committee included representatives from the Joint Staff and the Department of the Navy.

Between the time the study was initiated in September 1989 and April of this year, members of the IDA study team met with the steering committee five times to inform them of our plans and to update them on our progress. The committee, for its part, provided us with additional sources of information, occasionally suggested alternative approaches from the ones we had proposed and identified a wide range of sensitivities to be examined.

The steering committee also asked other Department of Defense agencies to review specific portions of the assessment. The amphibious assault scenarios and concepts of operation were reviewed by the Marine Corps War Fighting Center at Quantico and by the Joint Staff. The specific aircraft configurations used in the assessment and the flight performance projected for those aircraft were reviewed in detail by the appropriate staff elements at the Naval Air Systems Command. The development, procurement, and oper-

ating costs estimated for the aircraft were reviewed by other staff sections at the Naval Air Systems Command and by OSD's Cost Analysis Improvement Group.

Our last presentation to the steering committee took place on April 16, when we briefed them on the overall results emerging from our study. At that time, however, we still had some additional analyses to perform, some additional sensitivities suggested by the steering committee, and additional analyses that had been suggested by our own IDA reviewers, and we had not yet completed our written report. Those tasks were accomplished over the next 2 months. Following IDA's detailed review, the draft study report was forwarded to OSD in late June and thereafter to the Congress.

COST ISSUES

At this time, I would like to address the two cost issues that I mentioned in the opening. In our study, we specifically structured the alternative assault aircraft fleets so that the cost to develop, purchase, and operate those fleets for 20 years would be the same in constant, fiscal year 1988 dollars. This so-called equal cost approach is frequently employed in assessments of this type because it allows easier comparison of the alternatives with respect to the missions to be performed. When all of the alternatives cost the same, the one that provides the most capability is the most cost effective. This simplifies the identification of the preferred alternative over the 20-year timeframe examined.

As you are all aware, the V-22 Osprey fared quite well in this assessment. As you also know, there is another perspective regarding costs that the Department of Defense and the Congress must consider, particularly when resources are as tightly constrained as they are at the current time. The alternative aircraft programs, while equal in cost over 20 years, would require different levels of funding in the near term.

Because the V-22 would cost more per aircraft than any of the other alternatives, and because completing its development and setting up projection facilities would require approximately $1 billion, the V-22 program would cost more in the near term than the Department has currently allocated for all of the services' assault aircraft programs. Thus, although the V-22 appears to have advantages of the long term, we know of no way to avoid its greater expense in the short run.

At this time, I would be prepared to present a short presentation on our principal findings, and then Dr. Randall and I would be pleased to answer any questions at all that the committee might have.

Senator INOUYE. Please proceed.

ASSESSMENT OF ALTERNATIVES FOR THE V-22 ASSAULT AIRCRAFT PROGRAM

JUNE 1990

L. DEAN SIMMONS, PROJECT LEADER

SLIDE 1

CONGRESSIONAL DIRECTION

HOUSE ARMED SERVICES COMMITTEE

"THE COMMITTEE DIRECTS THE SECRETARY OF DEFENSE TO PROVIDE WITH THE FISCAL YEAR 1991 BUDGET REQUEST AN INDEPENDENT COST AND OPERATIONAL EFFECTIVENESS ANALYSIS (COEA) OF ALL REASONABLE V-22 ALTERNATIVES INCLUDING, BUT NOT LIMITED TO, THE CH-53E, BV-360, EH-101, CH-46E, CH-60 AIRCRAFT OR ANY COMBINATION THEREOF."

SLIDE 2

Dr. SIMMONS. As you are aware, Mr. Chairman, the original direction for this study was provided by the House Armed Services Committee, which specifically directed the Secretary to provide with the fiscal year 1991 budget request an independent cost-effectiveness assessment of the V–22 and all reasonable alternatives.

CONGRESSIONAL DIRECTION

APPROPRIATIONS CONFERENCE

"...THE COEA STUDY...SHOULD ADDRESS ALL ASPECTS OF OPERATIONS THAT COULD BE PERFORMED BY THE V-22 OR ITS ALTERNATIVE, NOT JUST THE OPPOSED AMPHIBIOUS ASSAULT MISSION. THEREFORE, IT IS PARTICULARLY IMPORTANT THAT THE ADVANTAGES OF THE V-22 FOR SPECIAL OPERATIONS FORCES AND DRUG SMUGGLING INTERDICTION MISSIONS BE EXAMINED IN FULL"

"...INCLUDE THE FOLLOWING KEY FACTORS:

- MISSION ANALYSIS OF MARINE CORPS' AMPHIBIOUS SHIP-TO-SHORE MOVEMENT, LONG-RANGE SPECIAL OPERATIONS, OVER-THE-HORIZON LANDINGS, FOLLOW-ON OPERATIONS, COMBAT SEARCH AND RESCUE OPERATIONS, AND DRUG INTERDICTION OPERATIONS;
- SURVIVABILITY AND THE COST OF ATTRITION;
- COLLATERAL COSTS SUCH AS INCREASED MANPOWER REQUIREMENTS, INCREASED PILOT REQUIREMENT, AND THE IMPACT ON BOTH STRATEGIC AND AMPHIBIOUS LIFT;
- THE DATE WHICH THE V-22 OR AN ALTERNATIVE CAN BE FIELDED AND READY FOR DEPLOYMENT."

SLIDE 3

In addition, the appropriations conference from the House and the Senate provided some additional direction as to which missions were to be examined and some other factors to be included in the assessment, and this long list of factors accounts, in part, for the considerable length of our study report.

OVERVIEW

- AIRCRAFT EXAMINED
  - V-22
  - CH-53E+
  - CH-46E+
  - CH-60(S)
  - NEW HELICOPTER (BOEING MODEL 360)
  - EH-101 (UK/ITALY)
  - CH-47M
  - SUPER PUMA (FRANCE)
- MISSIONS EXAMINED

MARINE CORPS	OTHER SERVICE OR AGENCY
- AMPHIBIOUS ASSAULT (INCLUDING OVER-THE-HORIZON LANDINGS) - SUBSEQUENT OPERATIONS ASHORE (INCLUDING RESUPPLY TO FORWARD DEPLOYED FORCES) - DEPLOYMENT MISSIONS - HOSTAGE RESCUE OR RAID	- COMBAT SEARCH AND RESCUE (NAVY) - LONG-RANGE SPECIAL OPERATIONS (AIR FORCE) - DRUG INTERDICTION (DoD, DEA, COAST GUARD, CUSTOMS) - ANTISUBMARINE WARFARE (NAVY)

- COST-EFFECTIVENESS ASSESSED BY COMPARING CAPABILITIES OF EQUAL-COST AIRCRAFT FLEETS AT TWO FUNDING LEVELS

SLIDE 4

A quick overview: we examined eight different aircraft, singly and in combination, to provide the various assault aircraft missions—the V-22, all of the helicopter alternatives cited in the House Armed Services Committee directive, and two alternatives that we thought reasonable based on their capabilities (the Army's CH-47 Chinook, a marinized version of that aircraft, and the French firm Aerospatiale's Super Puma aircraft, which has about the same characteristics as some of the other helicopters we were examining). We examined eight different missions for the aircraft—four for the Marine Corps, four for other service or Government agency missions. All of those had been identified in the directions provided by the Congress to the Secretary.

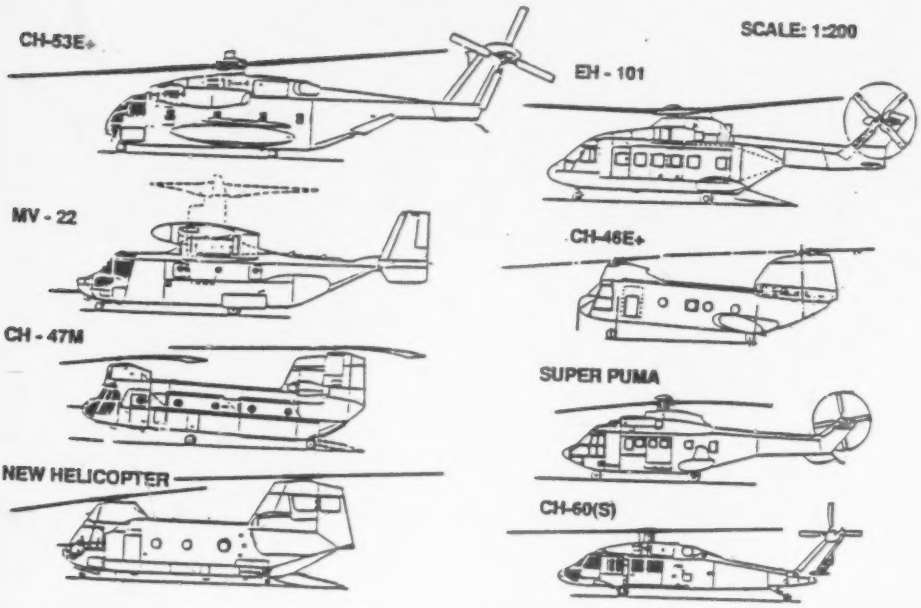
As I mentioned in my opening statement, we compared the cost effectiveness of the alternatives by looking at the capabilities of aircraft fleet size with equal 20-year system cost.

OUTLINE

- *AIRCRAFT CHARACTERISTICS AND COSTS*
- *MARINE CORPS MISSIONS*
- *OTHER SERVICE OR AGENCY MISSIONS*
- *NEAR TERM COSTS*
- *SUMMARY*

SLIDE 5

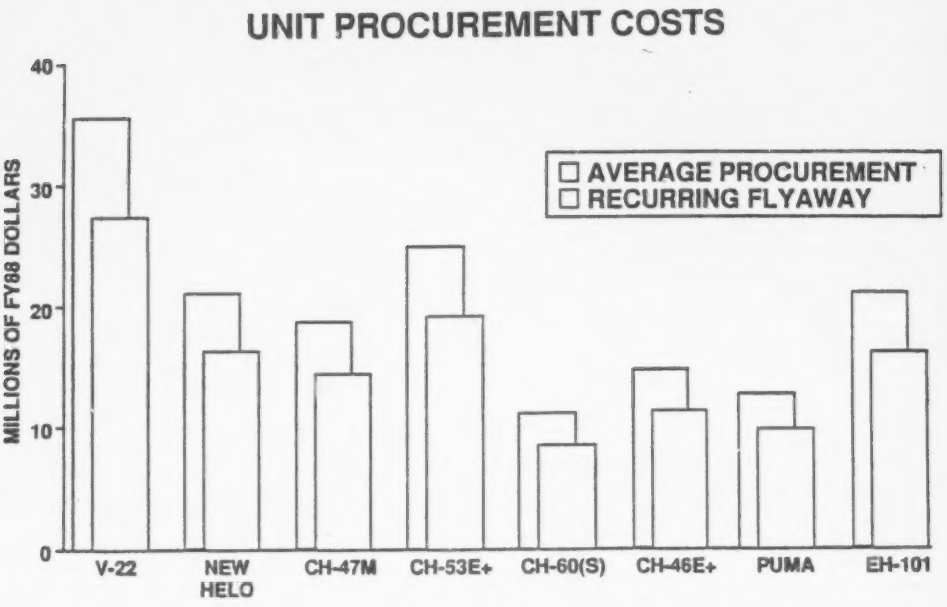
The outline for the remainder of the presentation is shown here. I will discuss briefly the aircraft, spend a considerable amount of time on the Marine Corps missions, discuss the four other service missions, discuss briefly the near-term costs, and summarize with two quick overview charts.



SLIDE 6

Here, shown to the same scale, are all of the alternative aircraft that we examined. The V–22 is the second aircraft on the left side of the chart. It is the only nonhelicopter aircraft that we considered, being a tilt rotor aircraft. We show the standard airplane configuration of the rotor and the helicopter configuration of the rotor.

The largest aircraft we considered is the Marine Corps' current CH–53E heavy-lift helicopter. The Army's Chinook is shown here, a new helicopter modeled on Boeing's 360 technology demonstrator, the British-Italian EH–101, the Marines' current CH–46, the Aerospatiale Super Puma, and the Army's CH–60 Blackhawk helicopter. Next.



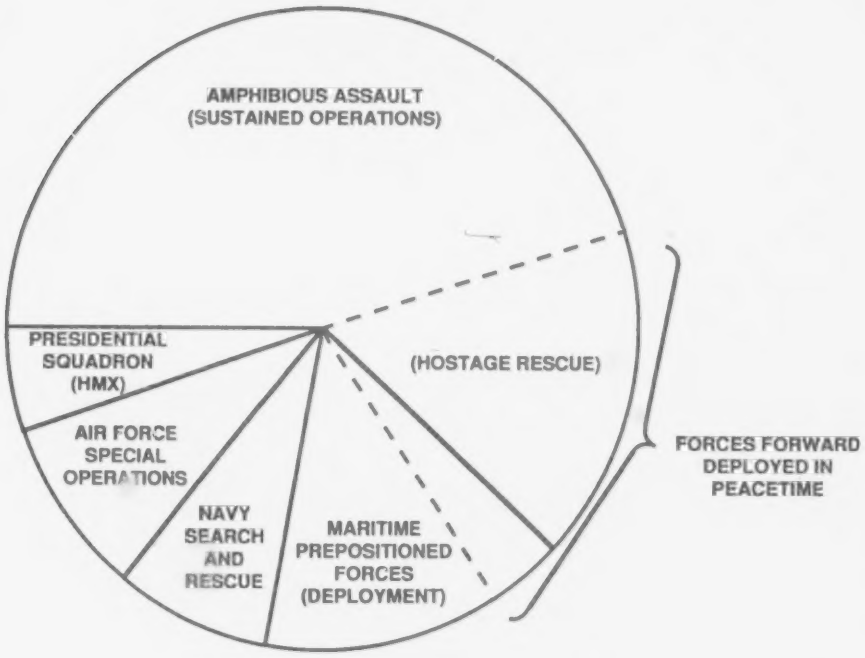
SLIDE 7

The difference in costs for the aircraft are illustrated here, where we show the unit procurement cost, both the average procurement cost and the fly-away cost for the aircraft. The costs for the V–22 are estimated to be substantially larger than those for the other aircraft, an average of about $35 million per V–22 over the entire program buy that has been proposed. The next most expensive aircraft would be the CH–53 heavy-lift helicopter, at about $25 million. As you can see, some of the helicopters have cost only on the order of $10 million each. Next.

MARINE CORPS MISSIONS

At this point, I would like to move to a discussion of the cost effectiveness for the Marine Corps missions.

ALLOCATION OF AIRCRAFT TO MISSIONS



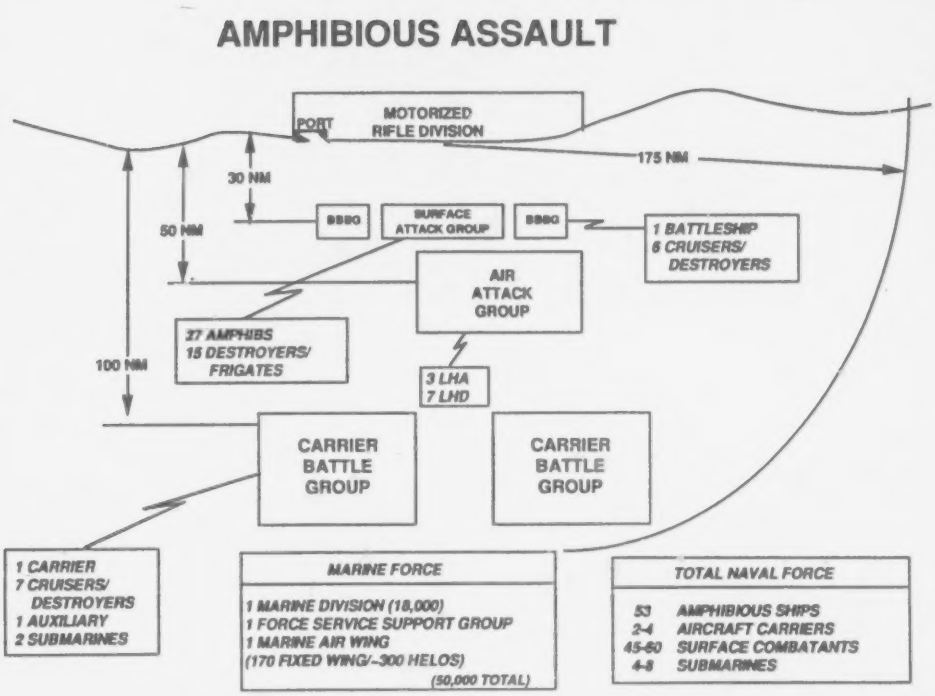
SLIDE 9

To give you an idea of how the aircraft are supposed to be used, on this chart we show the percent distribution of aircraft among the potential missions. Of the planned buy, about 60 percent of the aircraft would be designated for the amphibious assault or the sustained operations ashore mission. This is shown in the top portion of the chart that extends between the two solid black lines.

An additional one-fourth or so of the total aircraft would be designated for the Marines' maritime prepositioned forces. For deployment missions they have two brigades, plus a brigade that is designated for potential use on NATO's northern flank in that context. In addition, we show the peacetime forward-deployed forces that we modeled as carrying out a hostage rescue or small-scale combat raid mission.

The Marine Corps had also planned to buy 20 aircraft for the Presidential support squadron to replace the existing aircraft that are used there. Two other services, the Navy and the Air Force, also proposed to use the V-22—the Navy for combat search and rescue and the Air Force for special operations.

In our assessment, we measured capabilities for all of these potential uses for the aircraft with the exception of the Presidential support squadron.



SLIDE 10

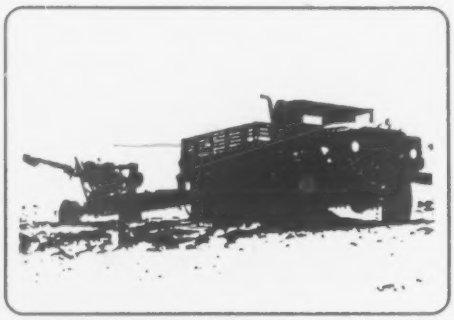
The first mission we looked at is the amphibious assault. The scenario we used envisions a division-size amphibious assault supported by the types of military forces shown here—carrier battle forces from the Navy, the amphibious assault ships shown in the tan or light brown blocks, and other Navy supporting forces that would provide protection for the amphibious forces. The threat force is postulated as a division-size force deployed over the red area shown. In carrying out this assault, the Marine forces would be landed in two ways: one-half by surface assault vehicles and landing craft, and the other one-half of the assault force by assault aircraft—the V–22 or one of the helicopter alternatives.

MARINE CORPS EQUIPMENT

HIGH MOBILITY MULTIPURPOSE WHEELED VEHICLE (HMMWV)

WEIGHT: 7,500 - 9,150 LB

M923 TRUCK AND M198 HOWITZER



TRUCK WEIGHT: 21,800 LB
HOWITZER WEIGHT: 18,250 LB

SLIDE 11

The next chart will give you an idea of the kind of equipment that is included in the Marines' vertical assault force.

The largest number of items of equipment are the high-mobility, multipurpose wheeled vehicles, or HMMWV's. The typical Marine vertical assault force includes about 300 of these vehicles, which are too large to fit inside any of the aircraft and must be carried in sling loads externally.

The other major vehicles for the airlifted force are the trucks and the artillery pieces that they tow to provide fire support for the Marine forces. Those two pieces of equipment are so heavy that only the large CH-53E helicopter can carry them.

AIRCRAFT FLEET ALTERNATIVES

HEAVY-LIFT AIRCRAFT

- **ALL FLEETS INCLUDE PLANNED CH-53E FORCE**

OTHER AIRCRAFT CAPABLE OF CARRYING HMMWVs

- **V-22**
- **NEW HELICOPTER**
- **CH-47M**

AIRCRAFT NOT CAPABLE OF CARRYING HMMWVs-- ADDITIONAL CH-53Es REQUIRED

- **CH-60 (STRETCHED)**
- **CH-46E+**
- **SUPER PUMA**
- **EH-101**

SLIDE 12

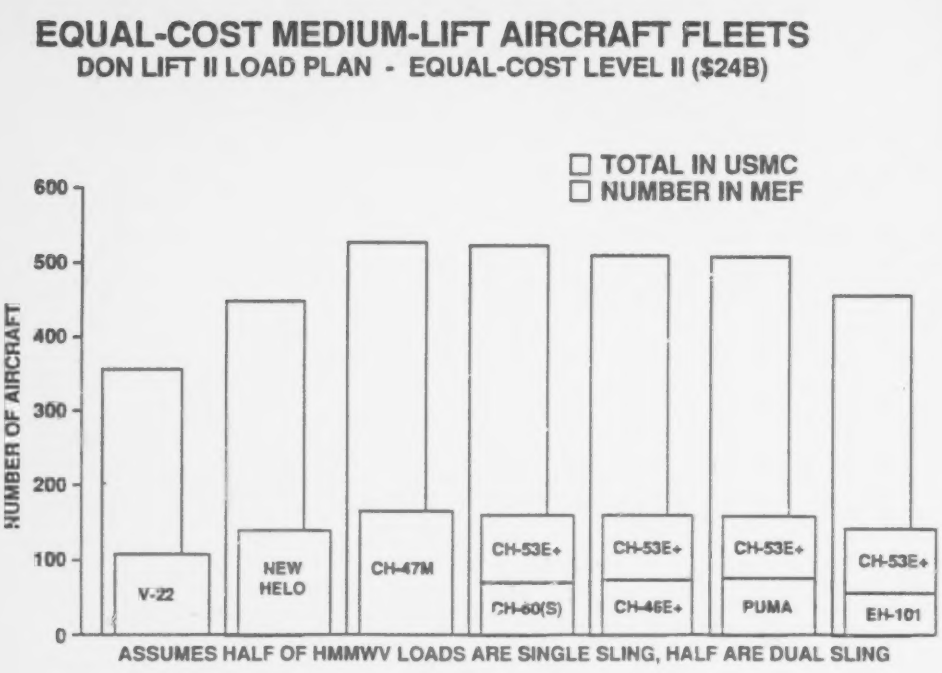
So, based on this equipment, we have constructed fleets of aircraft that we then compare in our effectiveness assessments. Because we had those large items of equipment, we assumed that all of our fleets would include the Marine Corps' planned CH-53E large helicopter force.

The other aircraft fall into two groups. Those that are large enough to carry the HMMWV as an external load. The V-22, a new design helicopter, and the CH-47 would fall into that class. Four of the other aircraft are too small to carry the HMMWV and in order to use those aircraft another helicopter would have to be provided in the mix. The most efficient way of doing that would be to add additional CH-53E's, so that is the assumption we made.

The other aircraft are the CH-60, the CH-46, the Super Puma and the EH-101. When we discuss alternatives, we will identify some of them by a single aircraft name—those are the ones that can carry the HMMWV. Other alternatives are designated by two names. That means that two types of aircraft are required, one to carry the Marine combat troops and one to carry the heavier equipment.

EQUAL-COST AIRCRAFT FLEETS

At this time, I would like to show you how we took the costs and constructed equal cost fleets.



SLIDE 14

The cost level that we have chosen to show you is what we call cost level II in our study, or $24 billion, the approximate cost of a fleet of CH–53E and CH–60 helicopters that would be comparable to the fleet that the Department of Defense substituted for the V–22 when that program was canceled.

Given the differences in the cost of the aircraft, you see on this chart that the number of V–22's that we can buy is lower than the numbers for any of the other alternatives. For this $24 billion, we could buy 356 V–22's and support them over 20 years of operation.

The lower portion of the bar designates the number of aircraft that would be available for the Marine Expeditionary Force, the division-size force that we assumed for our effectiveness analysis.

MARINE CORPS MISSIONS COST EFFECTIVENESS

Now I would like to discuss the effectiveness or the combat capabilities of those numbers of aircraft.

USMC MISSIONS

MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
AMPHIBIOUS ASSAULT	MOVE TROOPS AND EQUIPMENT ASHORE
SUSTAINED OPERATIONS	MOVE TROOPS AND EQUIPMENT TO SUPPORT COMBAT FORCES ASHORE
HOSTAGE RESCUE OR RAID	INSERT AND EXTRACT MARINE RESCUE OR RAIDING FORCE AND HOSTAGES
OVERSEAS DEPLOYMENT (NALMEB OR MPFMEB)	MOVE TO OVERSEAS THEATER AND TRANSPORT DEPLOYED MARINE FORCE TO COMBAT POSITIONS

SLIDE 16

First, for the amphibious assault mission in which the aircraft are used to move marines and their combat equipment ashore.

FACTORS EXAMINED IN COMBAT EFFECTIVENESS ASSESSMENT

FORCE STRUCTURE AND COMPOSITION FACTORS

- NUMBER AND MIX OF AIRCRAFT
- COMPOSITION AND SIZE OF MARINE ASSAULT FORCE
- TYPE AVIONICS IN ASSAULT AIRCRAFT
- TYPE VEHICLE USED AS HMMWV

TACTICAL FACTORS

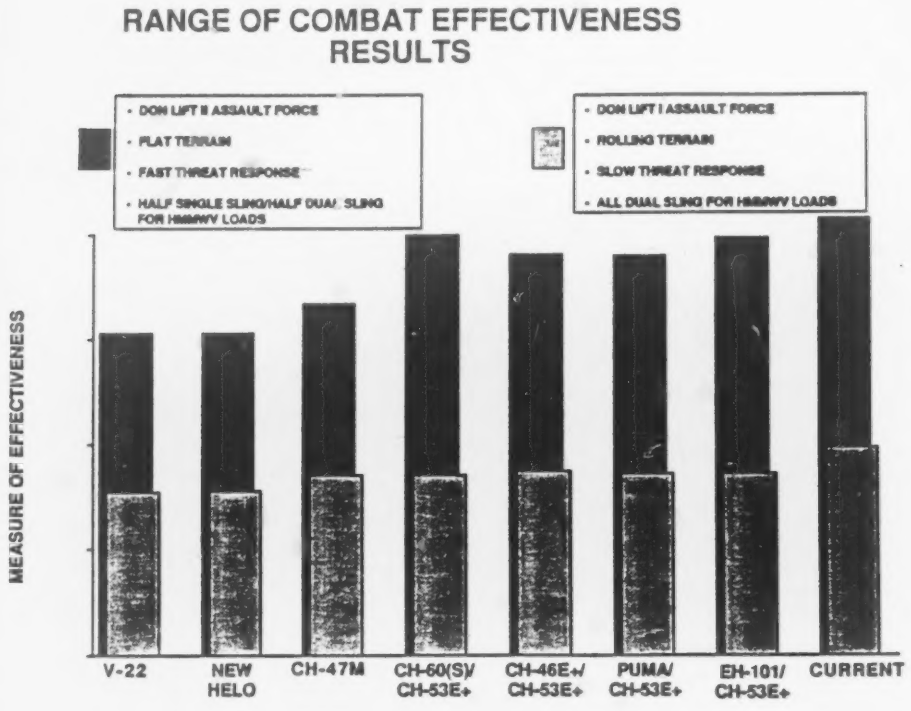
- STANDOFF DISTANCE
- HMMWV CARRIAGE
- TROOPS CARRIED IN CH-53Es AND CH-47Ms
- TIME OF ASSAULT

TERRAIN AND THREAT FACTORS

- TYPE TERRAIN
- THREAT FORCE SIZE
- THREAT FORCE RESPONSE
- NO AIRCRAFT ATTRITION

SLIDE 17

In this portion of the assessment, we examined a broad range of factors that could potentially influence the results. The wide set of variations that we considered is another of the reasons why our report is so large. We looked at differences in force structure and composition, the number of aircraft in the fleet, the composition of the Marine assault force itself, the type of avionics used in the aircraft, and the type of vehicle used as a HMMWV. We also examined a wide range of tactical factors, and similarly a wide range of potential operating terrain and threat factors.



SLIDE 18

The next chart gives you an idea of the range of combat effectiveness results that we obtained. The measure of effectiveness that we used here was the fraction of the marine assault force lost during the combat operation, both lost in assault aircraft en route to their landing zones and subsequent losses during combat operations ashore. So in this case, a lower number represents a more effective option.

We show two sets of results to give you an idea of the range of values that we obtained in our assessment. Under the first set of conditions, identified by the lower bars, there is very little difference among the alternatives, although if you look closely you will see that the losses incurred by the V–22 force are somewhat lower than those for the other alternatives. For a different set of conditions, particularly when the survivability features of the V–22 are more important, then the differences in losses are considerably larger.

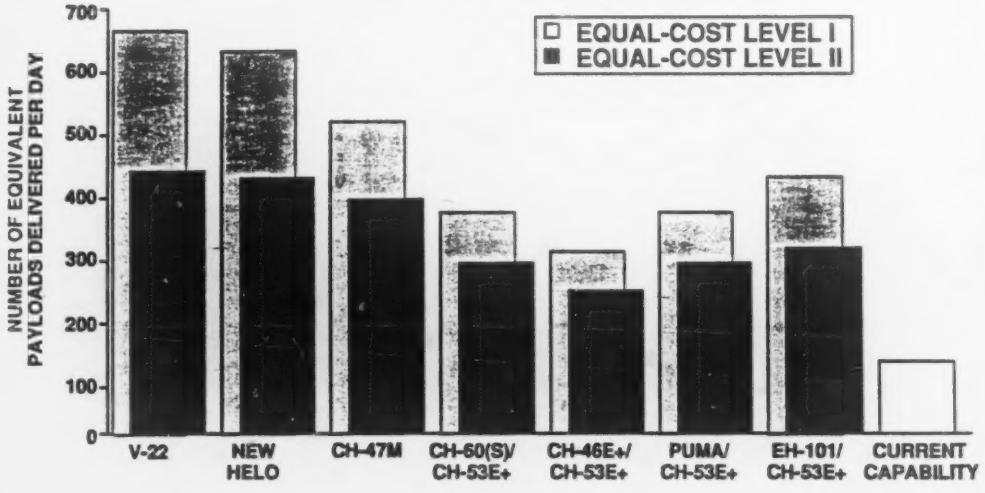
USMC MISSIONS

MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
AMPHIBIOUS ASSAULT	MOVE TROOPS AND EQUIPMENT ASHORE
SUSTAINED OPERATIONS	MOVE TROOPS AND EQUIPMENT TO SUPPORT COMBAT FORCES ASHORE
HOSTAGE RESCUE OR RAID	INSERT AND EXTRACT MARINE RESCUE OR RAIDING FORCE AND HOSTAGES
OVERSEAS DEPLOYMENT (NALMEB OR MPFMEB)	MOVE TO OVERSEAS THEATER AND TRANSPORT DEPLOYED MARINE FORCE TO COMBAT POSITIONS

SLIDE 19

The next mission that we examined was the sustained operations mission. During this mission it is assumed that the aircraft would have transitioned to shore from the amphibious lift ships where they would have been used for the amphibious mission, and at this time they would be used to support combat operations ashore.

SUSTAINED OPERATIONS



SLIDE 20

The measure of effectiveness we used here was the number of equivalent payloads that could be delivered per day over a 30-day period. Results are shown for both of the cost levels that we examined in the assessment—we have been focusing on the results obtained at cost level II at this point. Those are shown in the lower set of bars. Again, the V–22 provides more capability to deliver equivalent size payloads over the 30-day period that we examined.

You will also note, though, that all of the alternatives provide a considerable improvement over the Marines' current capability.

HOSTAGE RESCUE OR RAID

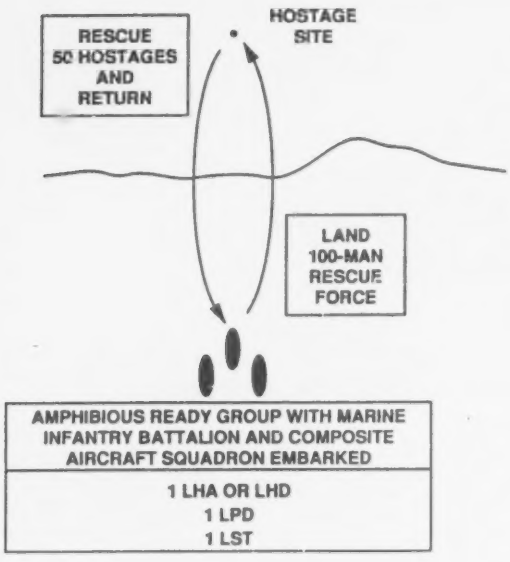
USMC MISSIONS

MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
AMPHIBIOUS ASSAULT	MOVE TROOPS AND EQUIPMENT ASHORE
SUSTAINED OPERATIONS	MOVE TROOPS AND EQUIPMENT TO SUPPORT COMBAT FORCES ASHORE
HOSTAGE RESCUE OR RAID	INSERT AND EXTRACT MARINE RESCUE OR RAIDING FORCE AND HOSTAGES
OVERSEAS DEPLOYMENT (NALMEB OR MPFMEB)	MOVE TO OVERSEAS THEATER AND TRANSPORT DEPLOYED MARINE FORCE TO COMBAT POSITIONS

SLIDE 21

The next mission that we examined was the small-scale hostage rescue or combat raid. In this mission the aircraft would be used to insert and extract a Marine rescue or a raiding force, and in the case of the rescue, to also extract hostages.

MEU(SOC) HOSTAGE RESCUE


RESCUE 50 HOSTAGES AND RETURN
HOSTAGE SITE
LAND 100-MAN RESCUE FORCE
AMPHIBIOUS READY GROUP WITH MARINE INFANTRY BATTALION AND COMPOSITE AIRCRAFT SQUADRON EMBARKED
1 LHA OR LHD
1 LPD
1 LST

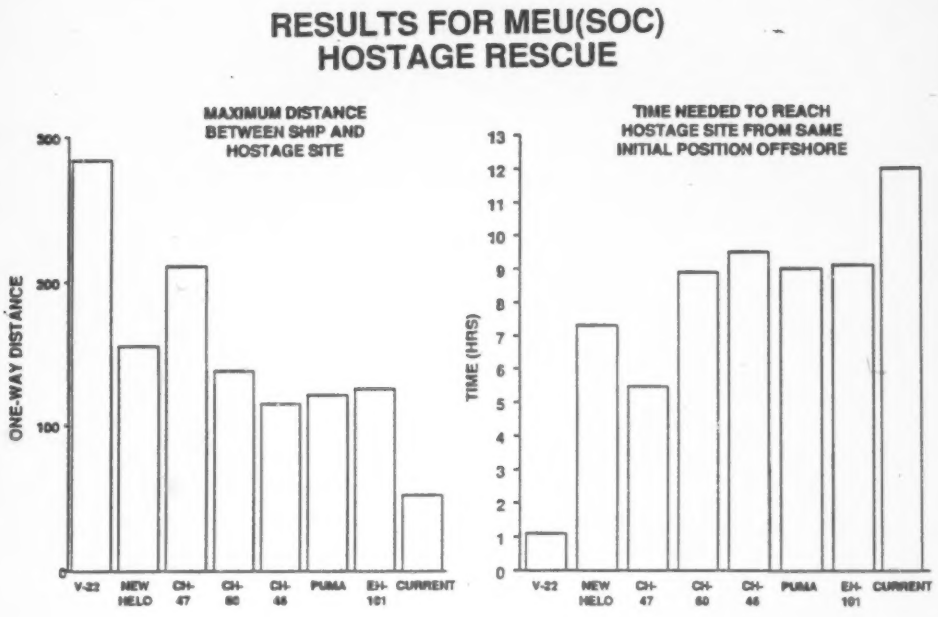
MEASURES OF CAPABILITY

- **MAXIMUM DISTANCE BETWEEN SHIP AND HOSTAGE SITE**
- **TIME NEEDED TO REACH HOSTAGE SITE FROM SAME INITIAL POSITION OFFSHORE**

SLIDE 22

How this operation would be conducted is depicted on this chart. It is assumed that it would be carried out by the forces deployed with a Marine amphibious ready group. We have two such units forward deployed at all times. During peacetime conditions it consists of an infantry battalion and a composite aircraft squadron that would include the assault aircraft and typically three ships. We assumed that the aircraft would be launched from these ships into some hostage site or a location for a combat raid. The rescue or raiding force would consist of 100 marines and they would rescue some number of hostages.

We measured the capability for this mission by looking at the maximum distance that we could be away from the raiding site and conduct the operation and the time it would take to reach that site from the same starting position offshore.



SLIDE 23

The results are depicted on this chart. The maximum distance between the ship and the hostage site is shown in the left-hand set of bars. Distance is measured in nautical miles and the various alternatives are listed along the bottom of the slide. The speed and range of the V–22 would allow it to conduct this operation from substantially greater distances offshore or to substantially greater distances on land than would be the case with any of the other alternatives.

Given this advantage in standoff distance, if we were to start the operation from the same point and we chose the largest of those distances as our starting point, the V–22 would have a 5- to perhaps 12-hour advantage in the amount of time it would take to reach the hostage site from the same starting position offshore.

OVERSEAS DEPLOYMENT

USMC MISSIONS

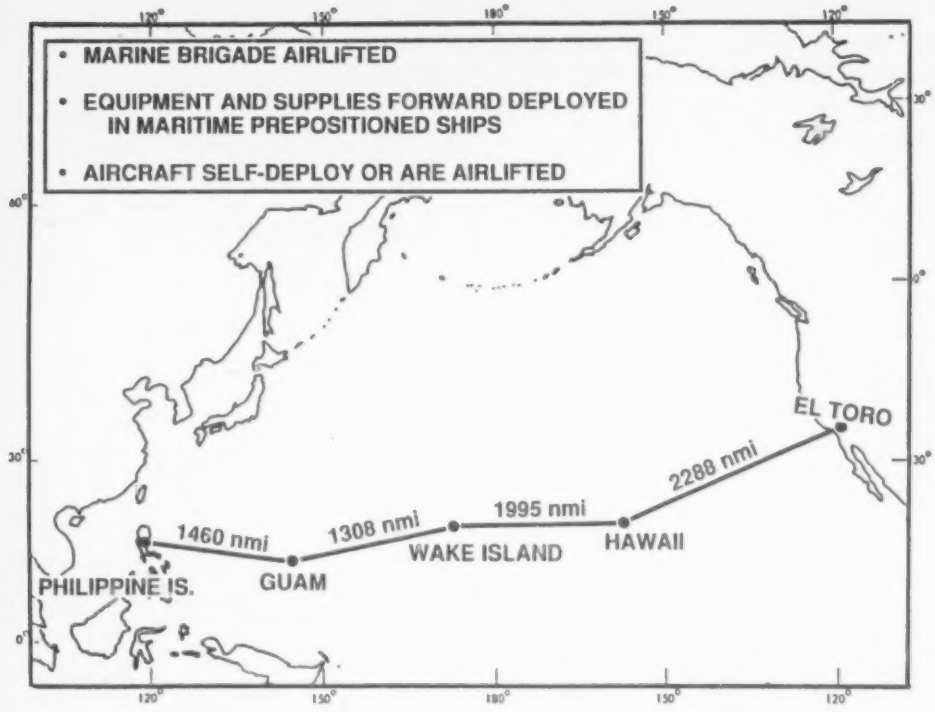
MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
AMPHIBIOUS ASSAULT	MOVE TROOPS AND EQUIPMENT ASHORE
SUSTAINED OPERATIONS	MOVE TROOPS AND EQUIPMENT TO SUPPORT COMBAT FORCES ASHORE
HOSTAGE RESCUE OR RAID	INSERT AND EXTRACT MARINE RESCUE OR RAIDING FORCE AND HOSTAGES
OVERSEAS DEPLOYMENT (NALMEB OR MPFMEB)	MOVE TO OVERSEAS THEATER AND TRANSPORT DEPLOYED MARINE FORCE TO COMBAT POSITIONS

SLIDE 24

The last Marine Corps mission we examined was the overseas deployment that would be used with our Norway air-landed brigade to move a brigade-size force to NATO's northern flanks or with one of our maritime prepositioned force brigades to operate in conjunction with the Navy's maritime prepositioned squadrons.

In this case, the assault aircraft would be moved to the overseas theater either by self-deploying in the case of the V–22 or being airlifted in strategic airlift aircraft. Once overseas, the aircraft would deploy Marine forces to their combat positions.

DEPLOYMENT ROUTE FOR MPFMEB AIR COMBAT ELEMENT

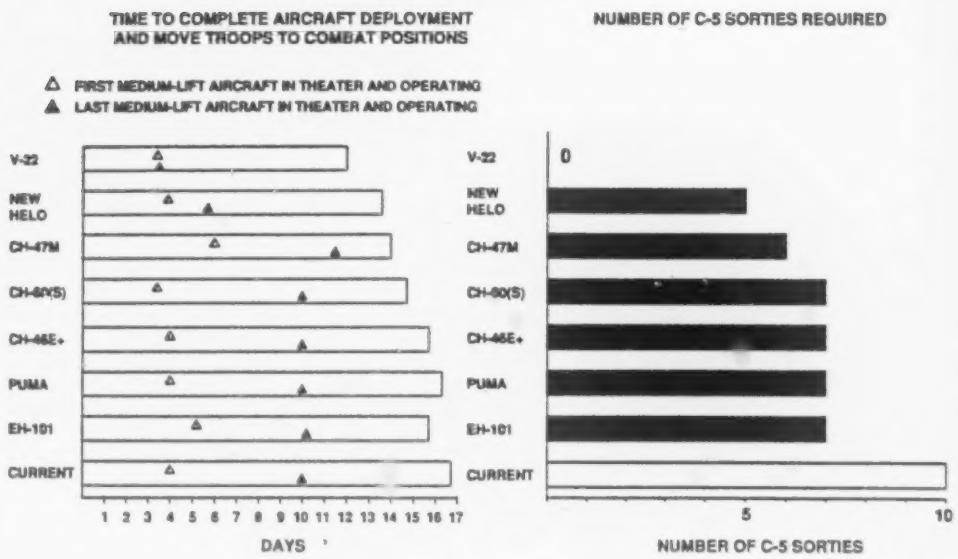


SLIDE 25

The typical deployment scenario is shown here. Moving from a Marine Corps base at El Toro, CA, to a combat site in the Philippines with intermediate stops as indicated in Hawaii, Wake, and Guam, the Marine infantry forces would be airlifted by Air Force aircraft. The equipment and supplies are already forward deployed in maritime prepositioning ships that are based at Guam in peacetime. The aircraft would self-deploy or be airlifted.

DEPLOYMENT MISSIONS

FORCES SIZED FOR DON LIFT I LOAD PLAN



SLIDE 26

The results for that mission are shown here.

The time to complete the aircraft deployment and move troops is shown in the left hand set of bars, the faster time giving you an advantage. The V–22, because it can self-deploy and the helicopter alternatives cannot, is able to reach the theater sooner, as indicated by the location of the two triangles, and complete the deployment of troops in the theater more rapidly than any of the helicopter alternatives.

The helicopters are at a disadvantage in this mission because they do not have sufficient range to self-deploy. At these distances, they would have to be disassembled, loaded into strategic airlift aircraft, flown to the theater, and then reassembled and flight tested before they could be used. That difference is indicated by the number of C–5 sorties required. The V–22 would require no sorties because it can self-deploy.

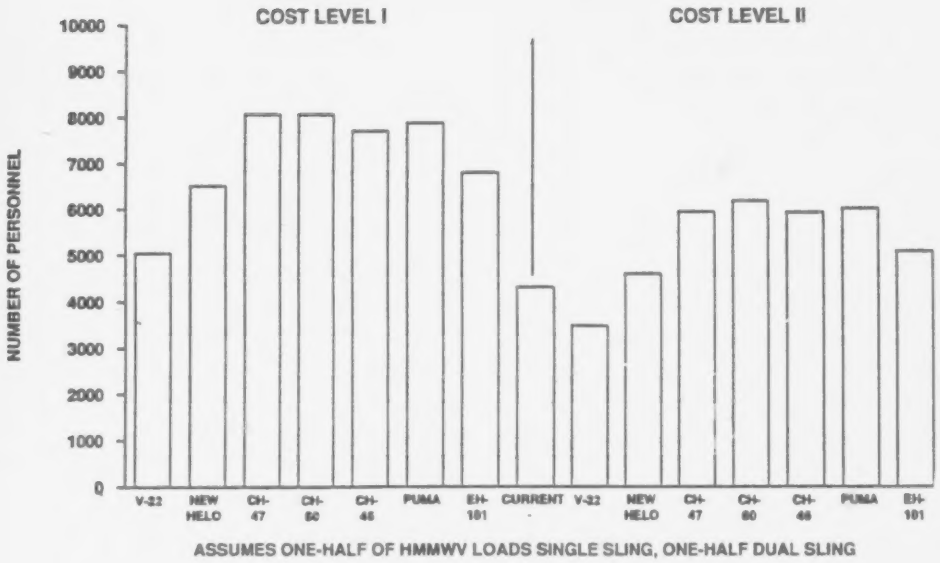
Moving any of the helicopter alternatives would require 5 to 10 sorties to move the air assault portion of the brigade force.

MARINE CORPS MISSIONS OTHER FACTORS

One other important factor with regard to the Marine Corps mission that we wanted to discuss is the manpower requirements.

MANPOWER REQUIREMENTS

PERSONNEL IN ACTIVE USMC MEDIUM-LIFT SQUADRONS



SLIDE 28

We show them on this chart. This is the number of personnel in the Marine Corps' active medium-lift helicopter squadrons. The number in those units today is shown by the bar in the center; about 4,500 Marines are assigned to those units. At the higher of the two cost levels examined all of the alternatives would add additional marines to those units, with the V–22 adding the least about 500 additional personnel.

At cost level II, the $24 billion level we have been focusing on in our briefing, the V–22 would allow a reduction of about 700 marines from current levels. All of the other alternatives for an equal cost force would require the addition of more marines for this mission.

OTHER SERVICE OR AGENCY MISSIONS

Now I would like to quickly discuss the other service or agency missions that we examined.

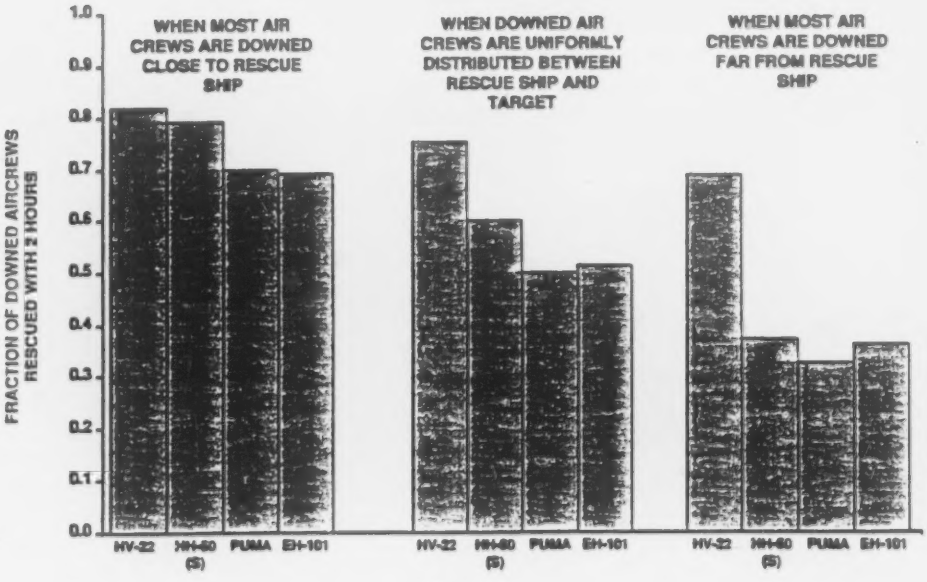
OTHER SERVICE MISSIONS

MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
COMBAT SEARCH AND RESCUE	RECOVER DOWNED AIRCREWS
SPECIAL OPERATIONS	INSERT AND EXTRACT SPECIAL OPERATIONS FORCES
DRUG INTERDICTION	TRAIL COURIER AIRCRAFT AND BOATS, DEPLOY LAW ENFORCEMENT PERSONNEL
ANTISUBMARINE WARFARE	DETECT AND ATTACK ENEMY SUBMARINES

SLIDE 30

The first of these is the Navy's combat search and rescue mission. The aircraft are used to recover downed air crews from strike or fighter aircraft.

RESULTS FOR NAVY COMBAT SEARCH AND RESCUE MISSION



SLIDE 31

The range of results we obtained for that mission are indicated on this chart. The measure that we used to compare capabilities is the fraction of the downed crews that can be rescued by the different aircraft within 2 hours. We looked at four alternatives: the V-22, the H-60, the Puma, and the EH-101.

Again, the range of results shown are for different conditions. If all of the air crews are downed close to the rescue ship, the V-22 has only a slight advantage over the H-60. But as the distances increase, the speed of the V-22 gives it an additional capability relative to the helicopters. In the most extreme conditions that we examined, the V-22 would have a factor of 2 advantage in the fraction of crews that it could rescue.

AIR FORCE SPECIAL OPERATIONS

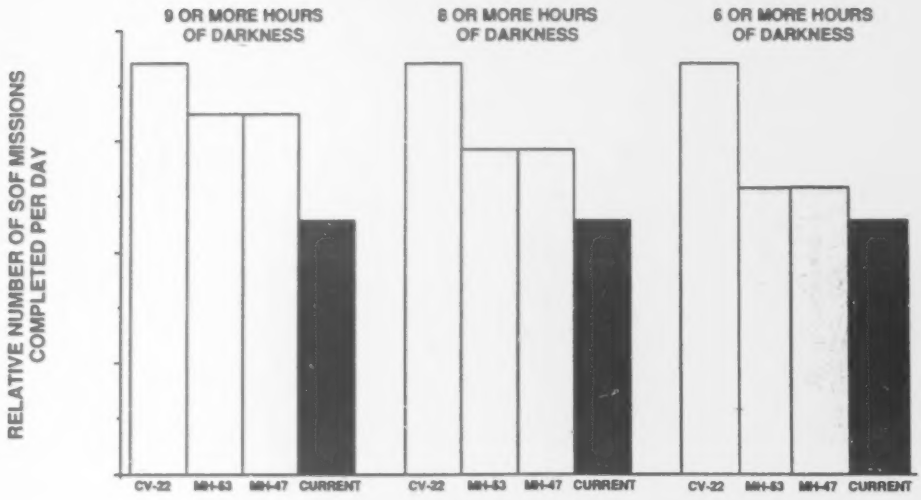
OTHER SERVICE MISSIONS

MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
COMBAT SEARCH AND RESCUE	RECOVER DOWNED AIRCREWS
SPECIAL OPERATIONS	INSERT AND EXTRACT SPECIAL OPERATIONS FORCES
DRUG INTERDICTION	TRAIL COURIER AIRCRAFT AND BOATS, DEPLOY LAW ENFORCEMENT PERSONNEL
ANTISUBMARINE WARFARE	DETECT AND ATTACK ENEMY SUBMARINES

SLIDE 32

The next mission examined was the Air Force special operations mission. In this mission, the aircraft are used to insert and extract special operations forces.

COST EFFECTIVENESS FOR US AIR FORCE SPECIAL OPERATIONS AIRCRAFT (U)



SLIDE 33

Our measure of effectiveness here is the relative number of special operations missions that can be completed each day. We looked at three alternatives: the V–22, the H–53, and the H–47 helicopters. We also show our current capability.

The important variable in this portion of the analysis was the amount of darkness available to accomplish this mission. For obvious reasons, the Air Force would like to be able to carry out the special operations airlift under cover of darkness to maintain the covertness of those operations. So as the number of hours of darkness diminishes, the speed of the aircraft becomes more and more a factor in the ability to accomplish the mission. You can see that there is very little effect on the V–22 as the number of hours of darkness is reduced from 9 to 6 hours. The helicopter alternatives, given their substantially slower speed, would be able to complete far fewer operations in a limited period of darkness.

OTHER SERVICE MISSIONS

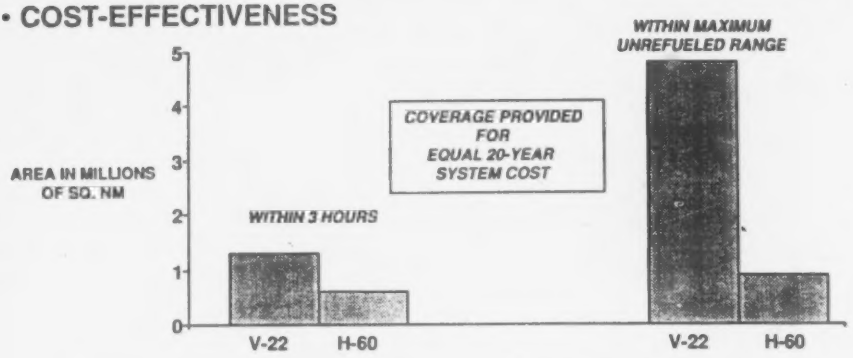
MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
COMBAT SEARCH AND RESCUE	RECOVER DOWNED AIRCREWS
SPECIAL OPERATIONS	INSERT AND EXTRACT SPECIAL OPERATIONS FORCES
DRUG INTERDICTION	TRAIL COURIER AIRCRAFT AND BOATS, DEPLOY LAW ENFORCEMENT PERSONNEL
ANTISUBMARINE WARFARE	DETECT AND ATTACK ENEMY SUBMARINES

SLIDE 34

The next mission examined was a drug interdiction mission that could be carried out by the Department of Defense or one of the other Government agencies. The aircraft would be used to trail the aircraft and boats that are used by drug couriers and to retrieve evidence and deploy law enforcement personnel.

DRUG INTERDICTION MISSION

- **AIRCRAFT CONFIGURATION**
  - **Air Surveillance Radar**
  - **IR Search and Track System**
  - **Turreted Gun or Two Machine Guns**
  - **Four-Man Crew**
  - **Five-Man Apprehension Team**
- **INTERCEPT CAPABILITY VERSUS LIGHT AIRCRAFT**
  - **Only Smallest Light Aircraft are Slower Than H-60 (160 knots)**
  - **Only Turboprops and Executive Jets are Faster Than V-22 (275 knots)**
- **COST-EFFECTIVENESS**



SLIDE 35

To carry out this mission we assumed the aircraft would be configured as shown here with a radar and an infrared search and track system. It would carry a four-man crew and a five-man law enforcement team.

We measured capability for this mission by looking at the ability of the aircraft to overtake the light aircraft that might be used by drug couriers. A helicopter with a dash speed of 160 knots would be able to overtake only the smallest light aircraft, whereas the V–22 with its dash speed of 275 knots would be able to overtake all but the larger turbo prop and executive jets.

In terms of cost effectiveness, we measured the coverage that could be provided by the aircraft for equal 20-year system costs. The coverage that could be provided within a 3-hour time period is about 1.5 million square miles for a V–22 compared to about one-half that number for a helicopter. The maximum distance in unrefueled range would be nearly 5 million square miles for the V–22 and only about 1 million square miles for a helicopter.

OTHER SERVICE MISSIONS

MISSION	CONTRIBUTION OF ASSAULT AIRCRAFT
COMBAT SEARCH AND RESCUE	RECOVER DOWNED AIRCREWS
SPECIAL OPERATIONS	INSERT AND EXTRACT SPECIAL OPERATIONS FORCES
DRUG INTERDICTION	TRAIL COURIER AIRCRAFT AND BOATS, DEPLOY LAW ENFORCEMENT PERSONNEL
ANTISUBMARINE WARFARE	DETECT AND ATTACK ENEMY SUBMARINES

SLIDE 36

The final mission that we examined is the Navy's antisubmarine warfare mission in which the aircraft are used to carry sensors that detect enemy submarines and then launch torpedoes to attack those submarines.

RELATIVE CAPABILITY TO DETECT ENEMY SUBMARINES (U)

AIRCRAFT	NORTH ATLANTIC	NORTH PACIFIC	INDIAN OCEAN
SV-22	1.0 - 1.1	1.0 - 1.1	1.0 - 1.1
S-3B	1.3	1.4	1.4

SLIDE 37

An unclassified version of our results is illustrated here, where we show the relative capability of the aircraft to detect submarines. In this case the Navy currently does not plan to replace its S–3 aircraft until the late 2010–20 period. Thus, on an equal-cost

basis, the current S–3 fleet would provide 20- to 30-percent more capability than could be provided by the SV–22 alternative.

NEAR-TERM COSTS

As I mentioned in my opening statement, there is considerable concern about the near-term cost of the aircraft. We tried to take that into account in our assessment.

NEAR-TERM COSTS FOR ALTERNATIVE FLEETS

AIRCRAFT ALTERNATIVE	COSTS INCURRED FY 1991-1997	NET PRESENT VALUE OR DISCOUNTED COSTS	YEAR MEB ASSAULT CAPABILITY ATTAINED
V-22 - NOMINAL PRODUCTION	$13.1	$16.3	1996
V-22 - SLOWED PRODUCTION	$7.7	$13.0	1998
NEW HELO	$6.6 - $8.7	$11.8 - $13.0	1999
CH-47M	$5.8 - $7.9	$11.6 - $12.8	1997
CH-60(S)/CH-53E+	$8.4 - $10.5	$13.6 - $14.8	1996
CH-46E+/CH-53E+	$8.3 - $10.4	$13.3 - $14.5	1998
PUMA/CH-53E+	$9.0 - $11.1	$13.6 - $14.7	1998
EH-101/CH-53E+	$9.6 - $11.7	$14.0 - $15.2	1997
ALTERNATIVE IN FY 1990 PRESIDENT'S BUDGET	$5.2	-	-

SLIDE 39

This is a duplication of one of the tables printed in our summary. We show the near-term costs for all of the alternatives that would be incurred in fiscal years 1991 through 1997, the net present value or discounted cost associated with the cost flow for each of the alternatives and then the year that a typical operational capability could be attained—in this case a brigade-sized amphibious assault. At the nominal production rate that has proposed for the V–22 aircraft before the program was canceled, its cost would have been markedly higher than those for any of the alternatives, $13.1 billion planned over the 7-year period 1991 through 1997.

Given that, we constructed with the aid of the steering committee a slowed production alternative for the V–22 that would stretch the program out and procure aircraft at a slower rate than had been originally proposed. The original production rates were on the order of 40 to 60 aircraft per year. We slowed that rate to 36 aircraft per year. Doing that would reduce the near-term cost of the

V-22 to just under $8 billion. Those costs would be in the range of those that we estimated for the helicopter alternatives.

The alternative that was proposed in the President's fiscal year 1990 budget would amount to $5.2 billion. There are some reasons for those differences. I would be prepared to go into those during our question session if you would like. The principal effect of slowing the production rate for the V-22 would be to delay by 2 years the time that it could have an effective operational capability—from 1996 until 1998. Some of the helicopter alternatives would provide an earlier capability: a CH-60 fleet, for example, in 1996, the CH-47 or the EH-101 by 1997.

SUMMARY OF RESULTS

SUMMARY

MARINE CORPS MISSIONS

- GREATER SURVIVABILITY OF V-22 AND NEW HELICOPTER PROVIDES THEM A SLIGHT TO MODERATE ADVANTAGE IN AMPHIBIOUS ASSAULT MISSION
- V-22 IS MOST COST-EFFECTIVE ALTERNATIVE FOR SUSTAINED OPERATIONS, HOSTAGE RESCUE/RAID AND OVERSEAS DEPLOYMENT MISSIONS

ALTERNATIVES TO V-22

- NEW HELICOPTER DESIGNED TO MARINE CORPS REQUIREMENTS IF WILLING TO START NEW DEVELOPMENT
- MARINIZED CH-47 IF PROBLEMS WITH QUADRICYCLE GEAR CAN BE OVERCOME AT LOW COST
- COMBINATION OF SMALLER HELICOPTERS TO CARRY TROOPS AND CH-53Es TO CARRY HMMWVs

SLIDE 40

A concise two-slide summary of our results is shown next.

For the Marine Corps mission, we found that the greater survivability of the V-22 and the new helicopter, which we assumed to be designed with survivability characteristics comparable to those of the V-22, would provide them a slight moderate advantage in the amphibious assault mission with a range of values typical of those that we showed you earlier.

For the other three Marine Corps missions, the sustained operations, the hostage rescue, and the overseas deployment, the V-22 was clearly the most cost effective of the alternatives.

In terms of the Marine Corps missions, the next best alternative would be a new helicopter specifically designed to Marine Corps requirements if the Government were willing to start a new development program at this time.

After the new helicopter, the next best alternative would be a marinized version of the Army's CH-47 Chinook. There is a poten-

tial problem with its landing gear and the ability to use that aircraft aboard ship. It would be necessary to find a solution to that problem. We were not able to examine that in detail in our assessment.

After those, the next best alternative would be a combination of any of the smaller helicopters such as the H-60 Blackhawk, to carry troops and the larger CH-53's to carry the marines' equipment.

SUMMARY (Continued)

OTHER SERVICE MISSIONS

- **V-22 IS MORE COST-EFFECTIVE THAN HELICOPTER ALTERNATIVES FOR SPECIAL OPERATIONS, SEARCH AND RESCUE, AND DRUG INTERDICTION MISSIONS**
- **S-3B IS MORE COST-EFFECTIVE THAN SV-22 FOR ANTISUBMARINE WARFARE MISSION**

NEAR-TERM COSTS

- **HIGHER PROCUREMENT COST OF V-22 LEADS TO LARGEST NEAR-TERM COSTS**
- **BY SLOWING PRODUCTION AND LENGTHENING TIME TO FIELD AIRCRAFT, NEAR-TERM COSTS FOR V-22 COULD BE REDUCED**

SLIDE 41

For the other service missions, the V-22 was the most cost effective for the special operations, the search and rescue and the drug interdiction missions. Given the Navy's plan to retain the S-3B aircraft well into the post-2000 time period, that aircraft would be more cost effective than an antisubmarine warfare version of the V-22 aircraft.

As we showed you, the higher procurement costs and the near-term funding requirements in terms of facilities and production line development would make the V-22 have the largest near-term cost of any of the alternative fleets. To some extent, we could mitigate those costs by slowing production and lengthening the time to field the aircraft.

At this time, Dr. Randall and I will be glad to answer any questions you have about our work.

Senator INOUYE. Dr. Simmons, I thank you very much. Your testimony has been extremely helpful.

I am certain all of us here are aware that this special hearing was convened because of the extraordinary concerns expressed by my colleague from Pennsylvania, Senator Specter. I believe he has spent more time than any one of us in studying the cost factors, the capability and effectiveness of the Osprey. Accordingly, I will yield to Senator Specter.

Senator SPECTER. Thank you very much, Mr. Chairman.

Again, let me express my thanks to you, Mr. Chairman, for convening this hearing. I think that its importance was established when Secretary Cheney, in making a long list of proposed cancella-

tions, put the V–22 Osprey at the top, No. 1, and I think that there have been very substantial concerns expressed in many quarters about the conflict between what Dr. Simmons has concluded and the summary rejection by the Secretary of Defense.

PANAMA

Dr. Simmons, I begin with the question as to General Pittman's statement that the V–22 would have saved lives in Panama. I would ask you whether you agree with General Pittman's conclusions that had we had the V–22, in fact, lives would have been saved in the Panama operation?

Dr. SIMMONS. Senator, I cannot answer that question directly because I have had no detailed knowledge of the Panamanian operation other than what has been discussed in the news or the print media.

Certainly, the V–22 relative to the other aircraft that we examined specifically in our assessment would have considerable survivability advantages. A considerable amount of attention has been paid to the design of the V–22 aircraft that would give it a greater ability to survive hostile fire than would be the case in particular for some of the helicopter alternatives that we examined.

Senator SPECTER. With respect to a very fundamental point, there is no doubt that the V–22's landing ability would have prevented combat losses, deaths and injuries attributable to the parachuting operation.

Dr. SIMMONS. Again, Senator, I am not aware of the details, so I really cannot discuss or answer the question in that regard.

Senator SPECTER. Let me move to another high-profile item.

Senator INOUYE. Would the Senator yield? Maybe Dr. Randall can respond to that.

Can you, sir?

Dr. RANDALL. I would be in pretty much the same situation, Senator. I think that is not an operation that we have analyzed at IDA and not something that we could comment on very directly.

Senator SPECTER. I will not press the Institute of Defense Analyses any further, Mr. Chairman. I think we might take congressional notice, or judicial notice, that if you can land in a helicopter, you can avoid death or injury from an airborne jump, and that those casualties could have been avoided.

I think that attests to the conservatism and adds credibility to the testimony of Drs. Simmons and Randall when they conclude that the V–22 is a superior craft for the reasons that they have articulated. I start with General Pittman because it is on the record that the V–22 would have saved lives in Panama. I wanted to cover that point and I think we have.

HOSTAGE RESCUE

I was about to turn to another very high visibility operation, and that is the operation for the hostages in Iran in 1980. Fortunately, we have not needed another such rescue operation, but I think it is very important when we evaluate the V–22 and alternatives that very considerable attention paid to hostage rescue, as you have. While I realize that you have not made a specific study of the

rescue operations in Iran in 1980, there has been considerable commentary on the failures of the helicopters and the difficulty of moving in the rescue operation. I would ask for your generalized opinion as to the significant, if not vast, superiority of the V-22 should the United States again be confronted with a similar rescue operation as that of 1980.

Dr. SIMMONS. A representative hostage rescue or small-scale combat raid was, in fact, one of the missions we examined in our assessment. As we showed there, the speed and range capabilities of the V-22 which, as you have noted, Senator Specter, are superior to those of the helicopters would, in fact, give an advantage in those types of operations.

CRITICAL CONCLUSIONS

Senator SPECTER. Dr. Simmons, I appreciate the testimony that you have given today and the very extensive report covering approximately 1,200 pages. I would summarize for purposes of this hearing your critical conclusion at volume 1, page 13, and ask if you stand by this central and critical conclusion.

"The V-22's speed, range, and survivability advantages could enable even the 356 aircraft fleet"—that is the number purchased with the smaller figure—"to be more effective sometimes significantly more and other times only slightly more, than all of the proposed helicopter alternatives in each of the four Marine missions examined."

That, I believe, Dr. Simmons, is the central issue as far as the marines are concerned. Is that accurate?

Dr. SIMMONS. Yes, Senator; that is the principal summary statement of our report, and we continue to stand behind that statement.

Senator SPECTER. The other critical summary statement appears in volume 1, page 15, and you have covered this in extenso but I think the crisp conclusion is important. I ask the same question about the accuracy of this conclusion. I will skip to volume, page 22. "The V-22 is more cost effective than helicopter alternatives for the Navy combat, search and rescue, Air Force special operations, and DOD or other Government agency drug interdiction missions."

Is that precise and accurate?

Dr. SIMMONS. Yes, sir.

COST EFFECTIVENESS

Senator SPECTER. Coming to the issue of cost, Dr. Simmons, there is a statement in the letter of transmittal from Secretary Cheney that your report's V-22 program would cost about $3.7 billion more than the Secretary of the Navy has recommended for the Marine Corps medium-lift operation.

My question to you is whether that statement excludes the budgeted cost of the heavy lift in the special operations?

Dr. SIMMONS. Yes, sir; I think it does. As I understand it—and perhaps you could seek clarification from Assistant Secretary Chu later on—no funds are currently provided in the DOD budget for

either the CH-53 heavy-lift or the Air Force special operations aircraft.

Senator SPECTER. Could you give us an approximation as to what those costs would be?

Dr. SIMMONS. Yes, sir; the totals that we have estimated and, in fact, the totals we show in the final table of the executive summary of our report include the costs not only for the Marine Corps medium-lift assault aircraft but the Marine Corps heavy lift assault aircraft, the special operations aircraft and the combat search and rescue aircraft.

Senator SPECTER. What is the figure for heavy lift?

Dr. SIMMONS. The heavy-lift CH-53E helicopter, depending on the rate at which the aircraft would be bought over the 7-year period from fiscal year 1991 to 1997, would total from $1.1 to $1.7 billion.

Senator SPECTER. How about the special operations?

Dr. SIMMONS. Again depending on the rate at which aircraft are bought for that mission, the costs would be from $0.7 billion to $1.5 billion, all in the same constant fiscal year 1988.

Senator SPECTER. And what was the third category?

Dr. SIMMONS. Navy combat search and rescue.

Senator SPECTER. What would that cost be?

Dr. SIMMONS. $0.5 to $1.2 billion, again depending on the rate at which aircraft are bought for that mission.

COST DIFFERENCES

Senator SPECTER. You testified, Dr. Simmons, with respect to the $5.2 billion figure on the alternative in fiscal year 1990's Presidential budget, and you said you might have some additional amplification to give. Would you please do so at this time?

Dr. SIMMONS. Yes, Senator. There were three principal factors that account for the differences between our estimates of the cost for a CH-60/CH-53 fleet that would be comparable to the one that the Department of Defense substituted for the V-22. The first of these factors is that we elected to stretch the configuration—the fuselage—of the CH-60 so that it could carry more troops at once. This increased the near-term costs for the CH-60 but reduced the overall cost for that portion of the alternative fleet.

The second area in which costs differed were the avionics assumed in the aircraft. We found in our assessment that all of the alternatives benefitted substantially by having avionics comparable to those planned for the V-22. The greatest benefit comes from increasing the ability of the aircraft to operate at night, particularly by the provision of the infrared night piloting system. This feature would make all of the aircraft substantially more survivable than they would be without that type of avionics.

As a result, we elected to include the costs for those avionics in the summary table that we showed in the front of our report. The option of using less capable avionics in all of the aircraft, including the V-22, was also examined in the study and the same relative rankings obtained for the alternatives; namely, that the V-22 was slightly to moderately more cost effective than the helicopter alternatives.

The third factor that accounts for the difference in the costs are increases in the estimated procurement cost for the CH-53 heavy-lift helicopter. In the interval since, the Department's estimate for the costs of the CH-60/CH-53 fleet were prepared, the contractor that builds the CH-53 for the Government has indicated that the costs of that aircraft would be $5 to $7 million higher than was last reported to OSD.

So those are the principal factors that made our fleets more expensive than the alternative proposed by the Department.

COMPARABLE COSTS OF ALTERNATIVES

Senator SPECTER. Dr. Simmons, where you have projected the cost of the V-22 at the slow production, what would be the comparable cost of some alternatives? You have testified that in order to perform the functions of the V-22 you are going to need a combination of the CH-53's and the CH-60's; if you add those two together, what cost figure do you get in the comparable period?

Dr. SIMMONS. At the production rates we assumed, those costs would be as we showed in the summary chart. I believe the numbers were on the order of approximately $8 billion, give or take.

Senator SPECTER. For the alternatives, $8 billion, contrasted with $7.7 billion for the V-22 at the slow production rate.

Dr. Simmons, when the results of the Institute of Defense Analyses were disclosed, a statement was made on behalf of the Secretary of Defense, Mr. Cheney, by Mr. Pete Williams, saying that the Secretary disagreed with the assumptions of the Institute for Defense Analyses. Did not the Department of Defense have total opportunity to question your assumptions or to provide additional information at every stage of your proceeding?

Dr. SIMMONS. Yes, sir; I would say they did. As I mentioned in my opening statement, we interacted five times during the course of the study with our steering group, of which more than half the members of the committee were members of the Secretary's staff.

Senator SPECTER. Mr. Chairman, there are many, many more questions, but that is the distillation of the highlights. And my suggestion would be that if we hear from Dr. Chu, I would like to reserve the balance of the questions until Dr. Chu has a chance to present the essence of his conclusions, and then really get a more effective contrast of the expert judgments. So I would limit my questions at this time to the ones that I have asked, which are relatively minimal.

Senator INOUYE. Do you wish to have Dr. Simmons remain here?

Senator SPECTER. Yes, Mr. Chairman, I think that would be the better process, so that he could hear Dr. Chu. And where there are differences, we can crystalize them in the course of the hearing.

Senator INOUYE. Would you favor us with your presence?

Dr. SIMMONS. Yes, sir.

Senator INOUYE. Thank you very much, sir.

I have a few questions here. Your study shows that the unit cost of the Osprey for the first 12 will be $123 million.

Dr. SIMMONS. I think one has to exercise some caution, Senator, in making the divisions from the cost numbers that we have shown. If one were to include that portion of the nonrecurring, one-

time facilitization and production line setup expenses, then, yes, sir, that division would be accurate. We typically take the one-time costs out and set them aside to be added up later. And I believe what would be called the recurring costs for the aircraft would start out at around $80 million per aircraft, and then rapidly drop off to $30 million to $35 million. And, in fact, over a 356- to 400-aircraft buy, the average cost would be about $35 million.

CH-53

Senator INOUYE. In your study, it appears that the depot maintenance costs for the CH-53E are about 28-percent higher than that of the V-22. Considering that the Osprey is a bit more sophisticated than the helicopter, how do you explain this difference?

Dr. SIMMONS. Well, in estimating not only the depot level costs, but all of the operating and support costs for all of the aircraft, we used the same cost-estimating methodology in all cases. That methodology was one that had been originally developed by the Navy specifically to estimate the cost of rotary wing aircraft. The cost analysts who worked with me on the study obtained that model from the Navy, went through it in detail, collected all of the necessary inputs, and estimated the cost based on the characteristics reported for the aircraft.

I think one factor that needs to be taken into account is that in our analysis in the cost that you are describing, the V-22 and the CH-53 would be assumed to have the same avionics. So one of the principal differences between the V-22 and the current aircraft would have been removed in estimating those costs.

As to whether the V-22 is considerably more complex, I am not sure I would go that far. The two aircraft—the CH-53 and the V-22—are approximately the same size within a few thousand pounds. Both of them are around 30,000 pounds empty weight aircraft. And I am not sure there would be that much difference in complexity.

One of the factors that could be contributing to the difference in the depot level maintenance costs would be the fact that the CH-53 has three engines and the V-22 has only two. And engine costs could contribute a substantial amount to that.

Senator INOUYE. Why did you assume that all the aircraft considered would have the same avionics?

Dr. SIMMONS. We considered actually, Senator, a range of avionics in the aircraft. We wanted to eliminate from the argument the differences in capability that would result from differences in avionics. So at the extreme end we assumed that all of the aircraft would have avionics comparable to those of the V-22, which, as you know, has about $2.6 million per aircraft planned for the avionic suite.

As a percentage of the total aircraft costs, that is a relatively small amount of average procurement devoted to avionics. It is something on the order of 8 to 10 percent.

As you know, some of our other more modern aircraft have substantially greater amounts of avionics. So we did not think that the V-22 type avionics was a dramatic departure in fitting that into all of the aircraft. But we went ahead and looked at other levels of

avionics, leaving out some of the items that have been planned for the V-22 and seeing how the aircraft would operate with those.

As I mentioned earlier, one of the big differences was in the capability of the aircraft to operate at night. The infrared night piloting system planned for the V-22 and included in that set of avionics provides substantial night operations capability that results in greater survivability for the aircraft. And those results were apparent in the effectiveness results that we calculated for the amphibious assault mission.

Senator INOUYE. Dr. Simmons, as I have indicated, if you could step aside for a few minutes, we would appreciate it very much.

DEPARTMENT OF DEFENSE

STATEMENT OF DAVID S.C. CHU, ASSISTANT SECRETARY OF DEFENSE FOR PROGRAM ANALYSIS AND EVALUATION

Senator INOUYE. And now, may I call upon Dr. Chu, the Assistant Secretary.

David Chu, Assistant Secretary of Defense for Program Analysis and Evaluation.

Secretary Chu, we are very happy to have you with us, sir.

Dr. CHU. Thank you, sir. Good morning.

I do have a longer statement, which I would like to submit for the record if I may.

Senator INOUYE. It will be made part of the record.

Dr. CHU. Thank you.

And I would attempt very briefly to summarize the principal points behind the Department's position on this aircraft, particularly in light of the IDA study, before responding to your questions.

COST CONCERNS

As Mr. Cheney has stressed, the fundamental difficulty with the V-22, as far as the Department of Defense is concerned, is the high up-front investment costs that are involved. If you translate the costs in the IDA report into today's dollars, fiscal year 1990 dollars, and look at the 356-aircraft buy averaged over the life of that program, this aircraft will cost us on average about $42 million apiece.

The hope from the beginning with this program has been that one could amortize the high up-front investment costs with smaller operating costs at some future point. Speaking frankly, the Department's track record in estimating future operating costs of new systems is not splendid. And in general, people tend to underestimate, even with the best intentions and the best models, what future operating costs are going to be.

The difficulty here is you are comparing a new system and its unknowns and uncertainties, the V-22, or a new helicopter, which was also looked at in the IDA study, with a series of systems with which the Department has a great deal of experience. And there is great doubt that one would ever realize the kinds of operating cost savings necessary to offset the up-front investment costs. Even if one did, it would be well beyond the year 2000, perhaps 2010 or 2015, before you saw a break-even point, and ignoring the fact that one is always more worried about money today than money tomorrow.

Perhaps more to the point, as Mr. Cheney stressed in his testimony to you just last month, the Department's difficulty, as you all appreciate at least as well as we do, is how to manage in the decade of the 1990's with substantially less funds than it has previously enjoyed; how to do reasonably well in that fiscal climate with

its most important missions; how to avoid letting "better" be an enemy of "good enough."

We have to do reasonably well, not perfectly, with these major missions with a lot less money than we have had before, and a lot less money than people had previously planned on when this aircraft development program was launched in the early 1980's. And, in fact, as Mr. Cheney stressed in his testimony, relative to the fiscal profile that pertained last year when he made his decision to cancel this program, the Department's top line in terms of the President's recommended numbers for fiscal years 1990 through 1994 has fallen by $167 billion, the equivalent of roughly one-half to two-thirds of a year's budget for the Department.

And in fiscal year 1991 alone, $22 billion has been removed. That top line, as you all appreciate, is substantially higher than the Congress is likely to enact for the Department. The Senate Armed Services Committee has, as we are all aware, removed approximately $18 billion from the fiscal year 1991 number already in its mark.

Therein lies the great difficulty with proceeding with this program. As the Secretary stressed in his letter, relative to what the Secretary of the Navy would recommend we spend on the medium-lift requirement, setting aside heavy-lift and other missions as separate issues, you would need almost $4 billion more in the period 1991 through 1997 than the Navy is prepared to spend on this mission, even at the President's fiscal numbers, which are higher than the Congress is likely to sustain in the end. Moreover, it would take you to about 2009 to finish buying the aircraft, even for the smaller IDA buy, and at the slower procurement profile that IDA has identified in its summary report.

What this would compel the Department to confront are a series of very painful tradeoffs to find the several billion dollars necessary to sustain that buy, not only in the period 1991 through 1997, but in the years beyond. The Secretary specifically pointed to the clear tradeoff within the amphibious mission area, which is whether we have enough money to buy both the ships that the Marines need and the aircraft, if we go for an elegant aircraft solution.

I think the essence of the Secretary's decision a year ago and his reconfirmation of that decision today has been to try to preserve sufficient funds so we could have a reasonable amphibious lift shipbuilding program, and a reasonable helicopter lift program for the Marines. If we instead select the V-22, what we are doing is driving some other important element out of the Department's budget or limiting our ability to afford it. And one of the things the Secretary has pointed to that we would have to consider is whether we can afford the kind of amphibious lift that we would need to get the troops to the theater of operation in the first place, however elegant the method then used to get them ashore.

STUDY ASSUMPTIONS

Now let me turn to the study itself. As in any study, as I think the questions here have elicited already, the conclusions are a function of the assumptions that one makes. And I think there are

three broad assumptions or sets of assumptions that are useful to focus on in thinking about the conclusions this study has reached.

V-22 PRODUCTIVITY

One is that for the V-22 itself, what IDA has done in its smaller buy—the 356-aircraft buy—is, in essence, assume much higher productivity from the V-22 than the Marine Corps itself has heretofore been willing to assume in positing landing requirements in its studies.

A key element in that productivity is flying the aircraft at fairly high speeds with external cargo loads. There had been some doubts earlier about whether that was wise or feasible. There still, in fact, remain some things that have to be tested and proven out. And obviously, there is the doctrinal question of whether the Marines want to move to the kind of sortie rate implied by the 356-aircraft fleet. It is a higher sortie rate than even their most recent amphibious lift study has identified as being their standard.

HELICOPTER PRODUCTIVITY

On the other hand, as far as the helicopters are concerned, I think the study limited helicopter productivity relative to their potential by a number of different assumptions. One of them is this question of whether you can carry, and to what extent can you carry, two vehicles externally as cargo under the larger helicopters, the CH-53 and the CH-47, or what is called dual-sling loading in the study.

I think some perspective on this issue is helpful. A year ago at this time, although the concept was tested in 1985 by the Marine Corps and viewed as promising, based on the limited tests that were done at that time, dual slinging was viewed as a heretical proposition. In the year that has elapsed, the Marines themselves in their latest lift study have come to the conclusion that one-half the time one could dual-sling load such cargo and the other one-half of the time carry only one vehicle per helicopter.

This is an important assumption in differentiating the productivity of the helicopters from that of a V-22 force. The larger helicopters could carry two vehicles apiece. To the extent they can carry two more frequently, they would be more productive, and you cut the size of the helicopter fleet that you need.

A second assumption that limits helicopter productivity is the issue of how many troops are carried internally in a helicopter. To take an example, as I understand the study at least, typically, when the CH-47 is used in the study, only 24 troops are carried internally. The helicopter is capable of carrying 42 troops.

Why were 24 assumed?

That is the Marine Corps standard, and it was not challenged in the study.

A third assumption that is important in the results is the doctrinal view that troops move first, then vehicles. This is an assumption that I think, on a net basis, disadvantages helicopters vis-a-vis the V-22. You basically have a certain amount of helicopter capacity waiting in the all-helicopter cases until all the vehicles are moved.

A fourth assumption that I think has an important effect on the results is the use of what is called the HMMWV, the high-mobility multipurpose wheeled vehicle, which is the small truck to which the Marine Corps has moved for its payloads. That, in essence, is the big element in cargo movements from ship to shore.

If one were willing to consider going to a smaller vehicle and downsizing some of the cargo payloads that are now put on that truck, which the Marine Corps is examining, to be fair about it—it is currently debating an operational requirement for just such a vehicle—such a vehicle could fit inside many of the aircraft now being discussed, as opposed to being carried externally. This would have a significant effect on the cargo-carrying capability of the different alternatives. I think it would reduce substantially the size of the helicopter fleet one would have to have in order to move the same force from ship to shore.

Finally, we would have some quarrel—and this is really an empirical matter about which we are still engaged in dialog with IDA—regarding the reliability assumptions that are made in the study, vis-a-vis the helicopters. I think we would argue they are somewhat more reliable than they have been assumed in the study to be. That also affects the kind of results that one gets from the study.

DISCOUNTING

The third broad class of assumptions to which I would call attention is the focus in the study on undiscounted costs. The alternatives were developed before any attempt was made to even out the differential time streams by applying discounting. So that one does not get the same appreciation of the cost problem as one does by focusing on the large up-front, near-term investment costs associated with the V-22, as opposed to the hoped-for long-term savings that it might produce.

And as a further element of that, one does not, I think, as much consider the uncertainty that is attached to the operating support costs of the V-22 as ought to pertain.

SUMMARY

To sum up, the Secretary has stressed repeatedly, I believe, that he views the V-22 as a potentially interesting aircraft. He is not criticizing the airplane. It is simply a matter that the Department cannot afford the near-term, up-front costs of buying this aircraft. And I think it is important to put its attractiveness and its many fine features into that perspective.

I think one of the very interesting conclusions in the IDA report is that all the alternatives, including the helicopter alternatives, generally perform better than the current force, often substantially better. And so this is not an issue of whether the Department is going to upgrade medium lift for the Marine Corps. The debate is over the best way in which to do that—what is the best way, in particular, in light of the very severe fiscal constraints the Department faces in the coming years.

Thank you, Mr. Chairman.

[The statement follows:]

STATEMENT OF DAVID S.C. CHU

Mr. Chairman, Members of the Committee:

Good morning. I am David Chu, the Assistant Secretary of Defense for Program Analysis and Evaluation. I am here at the request of the Subcommittee, and I will do my best to answer your questions concerning the Department of Defense's position on the V-22 program in light of the draft IDA study report that has been provided to you.

To summarize the Department's position: The V-22 program--even the scaled-down version in the IDA study--remains unaffordable in today's budgetary climate, which is likely to become even more stringent. While the V-22 has many positive attributes that no existing helicopter can match, it is still a tactical transport that would cost about $42 million per copy in today's dollars.

The major problem with the IDA study is that it attempts to optimize the use of resources at levels much higher than those now planned for the missions it examines, whereas the Department's problem is to find ways of performing the most critical missions at acceptable levels with considerably smaller resources. More specifically:

- The up-front costs of the V-22 significantly exceed those of the helicopter alternatives. (IDA does not seem to disagree on this basic point.)
- Offsetting long-term savings associated with the V-22 option are dubious and would accrue gradually over many years--to the extent that they occur at all.
- The alternative helicopter forces--perhaps in smaller numbers at lower investment and operating costs--can perform the higher-priority DoD missions at acceptable levels.
- In fact, all of the helicopter forces examined by IDA do better than today's force; thus the issue is how much more performance we should seek.
- Viewed in that broader context, the V-22's acknowledged advantages diminish in attractiveness.
- And the V-22 versus helicopter comparison is inapplicable for two of the missions treated in the study because DoD does not currently plan to buy more aircraft of any type to support these missions.

The attached paper elaborates on these points and provides additional material on the DoD position. In this paper we have generalized for brevity and to provide an unclassified discussion. We have attempted to do so fairly.

I would be delighted to answer your questions.

DOD POSITION ON V-22 IN LIGHT OF THE IDA STUDY

Introduction

- The Institute for Defense Analyses (IDA) study of the V-22 and helicopter alternatives was directed by the Congress; the Congressional tasking also mandated coverage of several potential V-22 missions that had not previously been considered.
- The study provides a lot of new information on the cost-effectiveness of the V-22 versus helicopter alternatives, but it does not support reversal of Secretary Cheney's decision to cancel the V-22 program on the basis of affordability.
- The decision to terminate the V-22 was made in the context of an overall Defense program that was considerably larger than the FY92-97 program now being developed by DoD, which many in Congress argue should be reduced further.
- The principal shortcoming of the IDA study is that it focuses on optimizing the use of a resource level that is far higher than DoD will receive. DoD's challenge is to figure out how to accomplish its most important missions--perhaps less well than would be possible with more resources--while achieving substantial savings.
- Moreover, the IDA study assumes we can change operational practices to play to the V-22's major strengths but downplays the advantages of the larger helicopters in the alternative forces. For example:

  - In its primary sizing case--opposed Marine Corps helicopter assault--the V-22 flies at a sortie level almost 50% higher than the rate posited in the Navy's most recent amphibious lift requirements study. To achieve this sortie level, V-22 must fly at speeds approaching 200 nautical miles per hour, with externally-carried loads, without damage to that cargo.
  - The substantially greater payload of the CH-53E and CH-47M helicopters at ranges out to 200 or 300 NM is given relatively little credit (e.g., the CH-53E requires one-fourth fewer sorties to move HMMWVs, although this does not change the number of CH-53s bought for IDA's equal-cost forces).
  - While these large helicopters are more vulnerable than the V-22 to enemy small arms fire, it should be noted that we already have CH-53s for demanding combat missions--Marine Corps helicopter assault and special operations behind enemy lines--and we are also buying MH-47Es for special operations.
- The remainder of this paper deals first with near-term and long-term cost aspects of the IDA study; it then discusses separately seven of the mission areas covered in the study; and it concludes with some brief observations concerning commercial applications of the V-22. In summary form, the following key points are made:
  - The up-front costs of the V-22 significantly exceed those of the helicopter alternatives.
  - Offsetting long-term savings associated with the V-22 option are dubious and would accrue gradually over many years--to the extent that they occur at all.
  - The alternative helicopter forces--perhaps in smaller numbers at lower investment and operating costs--can perform the higher-priority DoD missions at acceptable levels.

Near-Term Costs

- The driving factor underlying the V-22 cancellation decision was the comparative "up front" investment cost of the V-22 versus an alternative force of helicopters that was judged capable of performing two of the three military missions posited for the V-22--Marine Corps helicopter assault and Navy search and rescue--reasonably well. (The third mission, extraction of special operations teams at ranges beyond helicopter capabilities, was simply eliminated as unaffordable.)
- The previously-noted higher V-22 sortie rate (coupled with lower assumed peacetime attrition and modestly offsetting changes in lift requirements) results in a much smaller Marine Corps V-22 force than was under consideration when the program was terminated last year (356 versus 552 aircraft, a decrease of 36%).

- Even this downsized V-22 program would cost considerably more to buy in the upcoming program period than the same fraction of the equal-cost helicopter fleets developed in the IDA study.
  - Over FY91-97, the IDA study posits buying 86 V-22s for Marine Corps missions (24% of the Marine Corps total of 356), at a cost of about $5.6 billion (FY88 $).
  - The cost to buy the same 24% of the study's larger CH-47M, CH-53/60 and CH-53/46 fleets would range between $2.7 billion and $3.3 billion.

Long-Term Costs

- In the IDA study, the up-front costs of the V-22 are offset by the larger operating costs of the alternative helicopter forces over roughly the next 20 years.
- V-22 operating costs per aircraft assumed in the IDA study are slightly higher than those of the helicopters, as shown below (in FY88 $):
  - $2.28 million per year for the V-22
  - $2.13 million per year for the CH-47M helicopter
  - An average of $2.14 million per year for a mix of CH-53 and CH-60 helicopters
- Helicopter force operating costs are increased in the IDA study through buying helicopters in considerably larger numbers.

- To some extent this is an artificiality of the IDA study's "equal cost" methodology--it keeps buying helicopters until the sum of acquisition and operating cost is even.
- Whether helicopter forces of the resulting size would be needed is unclear, as discussed later.

- Two other points should be noted on this approach to determining force costs:
  - Future operating costs of the V-22 are more uncertain than those of the better-known helicopters. Whether the V-22 force will really cost less than IDA's much larger helicopter forces is simply unknown at this time.
  - Even if V-22 force operating costs are considerably lower, the savings thus generated would accrue in small annual increments that would not "break even" until 2015-2020. The annual operating cost for IDA's Marine Corps V-22 force of 356 aircraft would be about $530 million in FY88 dollars; IDA's 527 CH-47Ms and its mix of 525 CH-53 and CH-60 helicopters would both cost about $730 million per year. (Operating costs are only computed for 65% of each force that is actually operational; the remaining 35% are for "pipeline" and peacetime attrition.)

Marine Corps Aerial Assault

- The MEF-size amphibious assault constitutes the most important prospective V-22 mission.
  - It determines the size of the total Marine aircraft buy (other elements are essentially developed proportionally).
  - And the Marine buy was 84% of DoD's previously-planned V-22 acquisition (552 out of 657 aircraft).
- If one accepts as inviolate statements of lift requirements and aircraft load restrictions, and if one credits the V-22 with roughly 50% greater productivity than helicopters due to its speed/sortie rate, then the sizes of equal cost helicopter fleets developed in the IDA study are correct.
- But if one changes productivity and requirements/loading assumptions, the V-22 and helicopter forces converge in size.
- In fact, the IDA study identifies the CH-47M as the best existing helicopter alternative to the V-22.
  - This aircraft, although slower than the V-22 by a factor of 30 to 50%, is also capable of carrying payloads roughly 50 to 70% greater than the V-22 out to ranges of around 300 NM (allowing a round trip at the longest amphibious force standoff distance treated in the study, 100 NM).
  - The CH-47M can carry up to 42 troops, whereas the V-22 can only carry 24.
  - The CH-47M can also carry the High Mobility Multi-purpose Wheeled Vehicle (HMMWV)--the dominant equipment item moved by the V-22 and alternative helicopters--and 24 troops besides; the V-22 cannot do so.
  - If the HMMWV were replaced by a smaller vehicle, it could be carried internally by the CH-47M, producing greater mobility and firepower early in an assault. The V-22 can also carry a small HMMWV internally, but with only 11 troops vice the desired load of 24. (Aircraft carrying externally slung loads are more vulnerable as they must hover longer prior to landing; since the current HMMWV must be carried externally by all candidate aircraft, a potentially significant combat advantage could accrue to aircraft that can carry a smaller vehicle internally.)
- If one were to fully exploit the CH-47M's larger troop-carrying capacity by moving 42 versus 24 troops in the initial assault phase of the operation, IDA's CH-47M force could be reduced by about 8%.
- If in addition one assumes that all HMMWVs can be carried in double loads (e.g., a smaller version internally and a regular one externally), then the CH-47M force could be cut by about 40%.
- If one instead assumes that only 30% of the aerial assault force's HMMWVs are converted to smaller versions that can be carried internally by the CH-47M along with 24 troops-- to provide greater mobility and firepower early in the assault phase--then the CH-47M force could be cut by about 20%.

- Another way of reducing helicopter loads would be to "double sling" HMMWVs from the larger helicopters. (This concept has been tested on the CH-53 but not on the CH-47M, although the latter aircraft has the load-carrying capacity. The IDA study's base case assumes double-slinging of half the CH-53E's HMMWV loads.)
- While the IDA study suggests that the CH-47M is the existing helicopter that would cost least for approximately equivalent aerial assault capability, it is also likely that more flexible usage of the CH-53E and/or adoption of a small HMMWV would produce CH-53/60 and CH-53/46 helicopter combinations that could perform the aerial assault mission acceptably with smaller numbers than IDA computed on an equal cost basis.
- Regardless of whether we buy V-22s or helicopters for Marine missions, the "small HMMWV with troops" option should be examined carefully. (In the IDA study this concept only appears as an excursion.)

Sustained Marine Corps Operations Ashore

- "Requirements" for tactical airlift in support of combat operations are highly scenario dependent and therefore inherently soft.
- The IDA study's examination of this mission area is based on an Army study that assumed operations over a much larger area than would be typical for the Marine Corps following a MEF-sized amphibious assault.
  - If larger forces and areas are involved, it is reasonable to assume tactical airlift support by Army helicopters and Air Force C-130s--forces we plan to have in any event.
- As shown in the IDA study, the Marine helicopter forces perform fairly well in more confined areas.
  - Out to radii of operation of around 150NM, for example, the CH-47M has 50 to 70% better troop and cargo-carrying capacity than the V-22, which could be important in some situations.
  - The slower speeds of the helicopters are less important over short distances.
- A critical factor driving the greater productivity of the V-22 is its higher utilization rate and ability to carry relatively small payloads over longer distances due to its speed. Again, this advantage shrinks as areas of operation become smaller.
- The study seems unduly pessimistic about the assumed utilization rate of the helicopters. For example, it employs the CH-47M at a rate of 1.7 hours per day, whereas Army data for the CH-47D suggest that a rate of 4 hours per day could be achieved.

MEU/SOC (Marine Counter-Terrorist) Operations

- For this mission the IDA study looks at a specific scenario involving rescue of 50 hostages from a location within range of a Marine force embarked in amphibious ships.
- In this case, the V-22's speed, longer range, and assumed greater reliability confer advantages on the order of 5 to 7 hours in response time, which the study points out could be critical to mission success if the terrorists were to discover that the hostages' location had become known.
- Situations where this extra degree of responsiveness would be critical could of course occur, but they might not occur very often.
  - It is much easier to foresee cases (assuming any intelligence is available in the first place, the real problem here) in which <u>neither</u> a V-22 or helicopter equipped Marine force could respond in time, or in which <u>both</u> forces could.
  - If one makes less pessimistic assumptions about helicopter reliability, the response time advantage of the V-22 over the CH-47M drops to about 2 hours. If one further assumes random location of the amphibious group within 2 days steaming time of the hostages' suddenly-revealed position, and that useful intelligence expires linearly over the two day period, then the overall probability of mission success is on the order of 3% greater for a V-22-equipped force than for a CH-47M-equipped one.

Deployment Capability

- The IDA study points out the V-22's capability to "self deploy" to considerably greater ranges than the alternative helicopters can achieve. While this is an acknowledged V-22 advantage, it should be put into context.

- The V-22 force does not entirely "self deploy"; at extremes of range it cannot carry any of the additional ground support equipment needed to operate, which must be airlifted by other aircraft.
- The overall difference in strategic airlift required to move a MEB-size force equipped with V-22s versus helicopters is small. For example, the percentage of projected airlift capacity generated over 20 days in moving to materiel prepositioned on MPS shipping would be:
  -- 1.66% for a V-22 equipped MEB
  -- 1.77% for a CH-47M equipped MEB
  -- 2.04% for a MEB equipped with a mix of CH-53s and CH-46s

Special Operations

- DoD had planned to buy 55 V-22s for special operations, largely for long-range extraction of SOF personnel. (The V-22 can make such pick-ups at distances 40 to 70% beyond the capabilities of the helicopter alternatives; the MC-130 can insert and resupply special forces at considerably longer ranges than either helicopters or the V-22 could retrieve them.)
- In this case, the decision was made simply to forego the capabilities brought by V-22 to this mission, relying on shorter-range helicopters already bought, or being bought, for SOF airlift, together with the longer-range MC-130s. Major savings on both acquisition and operations resulted from this decision.
- With the sizable investment already made, or planned, to build up SOF airlift capabilities, DoD can meet a substantial majority of currently postulated requirements.
  - Due to changes in world conditions and US force planning concepts, these requirements--particularly for long-range operations--are being re-evaluated.
- In the absence of firm, critical needs for extracting special operations forces in the range interval made feasible by the V-22, DoD's decision not to spend the IDA study's nominal $6 billion (or any other large amount) for either the V-22 or a lesser-capability helicopter force remains sound.
- In fact, IDA's results could call into question our decision to procure MH-47s; the study suggests that we might need a greater proportion of aerial tankers relative to helicopters.

Search and Rescue

- When the V-22 program was terminated, 50 H-60 helicopters were substituted for the 50 V-22s programmed for the Navy's search and rescue (SAR) mission (a variant of the H-60 is used by the Air force for this mission).
- Considerable savings also resulted from this decision, although the loss in SAR capability was clearly recognized.
- While the V-22's SAR capabilities are superior in the cases examined in the IDA study, in other situations the difference could be less pronounced, e.g., when search speed is reduced to account for weather or light conditions.
- Overall Navy priorities for keeping carrier force levels up, and combat aircraft inventories modernized, effectively preclude expending additional resources to re-institute a V-22 buy for the SAR mission.

Drug Interdiction

- This is another case in which IDA did the best it could in examining V-22 or helicopter use in a new mission area, but appears to have focused somewhat too narrowly.
- DoD does not buy any aircraft explicitly for drug interdiction; instead it assists other government agencies in counter-drug operations, employing ships and aircraft procured for military purposes.

Commercial Applications

- Some supporting the V-22 cite its potential to give US industry the dominant role in what is asserted to be a lucrative commercial market, thus generating thousands of jobs and improving the U.S. balance of trade.

- This may or may not be an accurate forecast, but it should be noted that DoD has already funded V-22 R&D amounting to more than $2.3 billion; it is not clear that further subsidy is needed.
- Moreover, if there were a profitable commercial market, presumably the V-22 consortium would stake its own money on behalf of such an enterprise. One has to believe that Boeing, a partner in V-22 and a world leader in aviation, with a proven track record of judging which are the profitable investments, would fund a commercial development if it were indeed an attractive proposition.

Senator INOUYE. Thank you, Mr. Secretary.
Senator Specter.
Senator SPECTER. Thank you, Mr. Chairman.

SURVIVABILITY

Secretary Chu, do you disagree with General Pittman's conclusion that the V-22 would have saved lives in Panama?

Dr. CHU. I am not aware of his statement on that matter, sir. And I think I would be careful not to get into what could be construed as an interservice rivalry on who was best equipped to carry out that particular mission.

Senator SPECTER. Well, the absence of General Pittman would certainly facilitate no interservice rivalry.

Dr. CHU. Excuse me, sir?

Senator SPECTER. Keeping General Pittman away from these hearings helps out.

Dr. CHU. I am not quite sure what you are referring to.

Senator SPECTER. Let me begin again.

I represent to you that General Pittman said that the V-22 would have saved lives in Panama. Do you disagree with that conclusion?

Dr. CHU. I am not sure I could assess that conclusion without looking at the details of the actual operation and what kind of aircraft were or were not used. The V-22, of course, was not available in that particular timeframe.

Senator SPECTER. Are you aware of the loss of lives and injury in Panama which resulted from parachuting operations?

Dr. CHU. Yes, I am.

Senator SPECTER. Would the V-22, which eliminates the necessity of parachuting, have saved lives and injuries?

Dr. CHU. Not necessarily. I think that is an important point. It raises a very interesting question. I think it is important to stress that, as the IDA study shows, all aircraft take losses in these operations. The issue is what is the relative loss. I would argue the differences are modest. But you are not going to conduct these operations without losses.

And so the issue you are raising is, would we have fewer losses if we used an aircraft approach, specifically V-22, as opposed to paratroopers. Without some careful calculations, and I am sure some quite energetic inputs from the Army, I would be unwise to speculate on which one is the better approach.

Senator SPECTER. So you say there would be modest differences, but differences nonetheless?

Dr. CHU. No, sir; that is not what I said.

Senator SPECTER. Wait until I finish the question, Dr. Chu.

Dr. CHU. Excuse me.

Senator SPECTER. And I will not interrupt your answer.

So you say there would be modest differences, but necessarily some differences, in loss of life and injury if you had the V-22, contrasted with not having it?

Dr. CHU. No, sir; what I said was that the IDA study indicated that you would have losses with all aircraft. Essentially, in terms of what the study focused on, the only difference in losses were to small arms fire. I would view the size of those differences as modest.

They are a function of whether the operations are at night or in daytime. The differences are much reduced at night. They are a function of the kind of terrain. They are a function of the specific assumptions IDA made about the altitude at which the aircraft flew. IDA did not, in fact, have the helicopters flying map-of-the-Earth operations, which would presumably reduce losses when carrying troops. The differences are a function of the reaction time one assumes for small arms fire.

My statement goes to what IDA found in its report. To the larger question you are raising, would we be better off eliminating paratroopers from the Nation's military force structure and buying the V-22, I think I would defer in trying to speculate on what the answer to that question would be.

Senator SPECTER. All right. Apart from the obvious conclusion that there are no parachuting losses if a helicopter lands the troops, let us go to the report of the Institute of Defense Analyses specifically and pick up the comment on page 13:

> The large CH-53E and CH-47M helicopters are 1.7 to 3.5 times more likely to be downed by enemy air defenses than is the V-22.

Do you disagree with that very important finding?

Dr. CHU. I think I disagree with the implication you would like to draw from it, sir. No one disagrees with the specific calculations IDA has made. The absolute numbers are classified. I think when one looks at the absolute numbers, one puts these proportional differences into perspective. I think it is also important to stress that those numbers are a function of the assumptions made in the study.

Specifically, in the study, if I understand it correctly, the reaction time assumed for enemy small arms fire is right at the edge of the speed envelope of the V-22, such that, in fact, the enemy gunners do not have much chance against the V-22, and that accounts ~~for its~~ small losses. Assume a faster reaction time and the helicopters will look better relative to the V-22. Assume a slower reaction time and everybody is going to look great.

The other thing I think important to stress in this debate is, as the study indicated, that all aircraft in these operations are going to take losses. The CH-53, as I think you appreciate, sir, is going to be used in these operations in any event, whatever decision is made on the V-22. In the Marine Corps' earlier calculation of requirements, just under 30 percent of all sorties have to be flown by the CH-53 because it is the only aircraft—either it or the CH-47—that can carry the heavier loads, the artillery, the larger trucks, the light armored vehicles that in earlier landing scenarios the Marine Corps planned to use.

So the CH-53 is going to be present, and we are going to endure losses for that aircraft whatever choice is made on the V-22. And the other point that I think is important to stress is we will have losses for the V-22 as well. It is not invulnerable.

Senator INOUYE. Will the Senator yield?

Senator SPECTER. Yes; I need time to reread the answer in any event, Mr. Chairman.

Senator INOUYE. I gather that you may have classified information which could materially affect the outcome of our decision. If you wish to submit such classified information we would be very happy to receive it in our secure facilities.

Dr. CHU. I would be delighted to, sir.

Senator INOUYE. Senator.

Senator SPECTER. Well, I am not going to pursue the question, except to restate the IDA conclusion about the high level of downing of the 53's and the 47's. And no one denies that there is a V-22 problem, but the comparison is very plain. There are so many questions to be covered that I think it not advisable to reanalyze your answer in terms of the question.

PRODUCTIVITY

You have testified, Secretary Chu, that the higher productivity assumed by the Institute of Defense Analyses is higher than the Marine Corps has been willing to assume. Let us cut right to the core of the issue to General Gray, the Commandant's position, summarized in the Navy Times on March 5, 1990, "Gray: The V-22 substitute scheme is ridiculous."

Now the Marines have testified on many different occasions about their very, very, very, very, very strong preference for the V-22. Do you disagree with General Gray that all of the proposed alternatives, all the proposed substitute schemes are ridiculous?

Dr. CHU. Yes, sir; I respectfully do. After all, we are living with one of those substitutes—the least attractive alternative in the IDA study—today, and that is the current fleet. I think one of the very important points the IDA study makes is that the current fleet really ought to be replaced. Then the debate begins on what the replacement should be. What Mr. Cheney endorsed a year ago at this time was an alternative that had long been viewed as the Marine Corps', if you will, fallback position if it did not get the V-22. That is, a combination of CH-60's—a fairly modern helicopter, with the survivability advantages of more modern helicopters, and that the Army is buying today and using today, and plans to use for a long time to come for combat assault—and additional CH-53's to carry the heavier materiel, specifically the HMMWV's.

There may be other alternatives that are just as good in the helicopter class, just as good or better than that one. In fact, I think the one, at least to my reading of the IDA report, that comes out as the alternative that clearly merits further consideration is some variant of the CH-47. This aircraft, as I know you are aware, is being pursued today for use by the special operations forces in the form of the MH-47E variant, with highly sophisticated avionics aboard.

This aircraft, in fact, has the advantage of a very large payload, not as fast as the V-22, not as modern in terms of survivability enhancements as a CH-60, but it is a very attractive alternative, at least as presented in that study. So I would have to disagree with General Gray's view. I, more keenly than anyone, I think, appreciate how much the Marine Corps would like to have this airplane. Mr. Cheney's decision is simply that we cannot afford it in this decade.

V-22 COSTS

Senator SPECTER. Secretary Chu, the transmittal letter from the Department of Defense of the IDA report states that the smallest V-22 program contained in the report would cost about $3.7 billion more than the Secretary of Navy has recommended for the Marine Corps medium-lift aviation. It is difficult to come to a precise minimal characterization, but I would suggest that this is misleading, if not disingenuous. Because there are other functions, such as the heavy lift and special operations, which are comprehended within the V-22 mission. So when you put a figure on a transmittal letter which says that it is $3.7 billion more than the Navy has budgeted, you left out very critical aspects of what the Navy budgets in other lines.

Now, you heard the testimony of Dr. Simmons that when you add in the other functions you come to the range of $2.3 billion to $4.4 billion, so that, in fact, the budgeting of the Navy is just about the same for the V-22 as the other missions' budgeting, and is in fact nowhere near a $3.7 billion differential. How do you respond to the modest characterization of that statement as misleading or disingenuous?

Dr. CHU. I do not think I said it was misleading or disingenuous.

Senator SPECTER. No; I said that.

Dr. CHU. I apologize then, sir.

Let me stress, I think you misunderstood the Secretary's statement. The statement in the letter is an apples-to-apples comparison that compares only the V-22's that are bought for the medium-lift requirement with the funding that the Navy has proposed for that requirement.

If we want to add back in amounts for special operations forces [SOF] and for other missions, in terms of what the Navy's recommended amounts are, frankly, that is only going to widen the differential that was stated in the Secretary's letter.

The bottom line here, sir, with great reluctance by the Department, is, we cannot afford to spend the kind of money that starting this production line and buying these aircraft in reasonable numbers would require. What we tried to provide was an apples-to-apples comparison, not a comparison that tries to slant the issue in one way or the other.

Now, the Secretary may overrule the Navy and decide to spend more money, but the Navy feels that it cannot spend anywhere near the amount of money necessary to start this line, begin production and buy aircraft for the Marine Corps, keeping in mind most of the aircraft that would be bought in the V-22 line would

be for the Marine amphibious assault mission; that is, a preponderance of the buy, something like 85-percent of the aircraft.

You could always argue we should add other missions, but then we have to add them into the base, and all you are doing by that is just raising the two absolute levels. The difference is going to be the same or greater if we compare recommended positions within the fiscal guidance the Department has to live with for those missions, with how much it would cost to buy the kinds of numbers of V-22's that are talked about in this report.

Senator SPECTER. Secretary Chu, I am prepared to stay apples to apples, but you have three bushels, not one bushel, and the fact is that the V-22 performs not only medium-lift but also heavy-lift and special operations, so that when Dr. Simmons testifies that if you take the $7.7 billion figure for the V-22 and you add the comparable alternatives, you come to $8 billion, which is slightly higher, which is at direct variance with the assertion in the DOD transmittal letter that the V-22 program is still more expensive than the alternative.

So my question to you is, do you disagree—well, I know you are going to disagree, so let me articulate it slightly differently. What reasonable basis do you have to disagree with Dr. Simmons' conclusion that the comparable alternatives would cost $8 billion contrasted with the V-22 at $7.7 billion?

Dr. CHU. I think for the specific figures that you asked Dr. Simmons about, he is buying helicopters at a far higher rate in terms of proportionate completion of the mission area than he is buying V-22's. If you look in my prepared statement, I have tried to show you what would occur if he bought the same proportion of the helicopter lift with his helicopter fleet sizes in the 1991-97 period constrained by his V-22 numbers. What you get are numbers that are in the same ballpark as the Secretary's $3.7 billion figure.

The essence of the answer, and I think Dr. Simmons would agree that the figures underlying the IDA report sustain it, is that all of the helicopter alternatives, even though more numerous in terms of the quantites of helicopters bought, cost less to procure. Now, because there are far more helicopters in the force—a point we might quarrel with in terms of how many are really needed if you move to an all-helicopter force—they, in the IDA procurement quantities, cost more to operate over the longer term than the V-22, at the force levels assumed for that aircraft in the report.

But I do not think IDA would disagree, and I think Mr. Simmons' prepared statement, at least as I read it, indicated that the up-front investment costs of a V-22 program are going to be larger than those of a comparably sized helicopter program. There is no way around that fundamental fact. This airplane will cost, in terms of the 356-aircraft program that IDA is citing as a smaller possible buy, $42 million a copy, on average, in fiscal 1990 dollars, to procure. That is higher than any other helicopter in sight, in some cases, several times higher.

Senator SPECTER. Mr. Chairman, I have many, many more questions, but I think at this juncture that the time of the subcommittee could be best used by contrasting the views of Secretary Chu and Dr. Simmons; Secretary Chu has made a great many assump-

tions which I would question him on at length, but I think it best if we put the two witnesses, the experts, head-to-head on that.

So I would conclude at this juncture with a very brief statement about what I see as the predisposition of the Department of Defense against the V-22 last year at a time when the projections for the DOD budget were vastly different. In the face of the specific factual information that the Institute for Defense Analyses has projected, there has not been the slightest acknowledgement of their very strong case.

Of course, when the judgments have to be made as to the needs of the United States, you consider strategic needs of the B-2, of the multiple missiles, contrasted with flexibility and what we may face in the Persian Gulf or a hostage rescue operation and in Panama: that is a congressional decision in which alternatives must be discussed.

We are well aware, here, of the very profound budgetary limitations. There is not a week, not a moment, not an hour, not a minute that goes by without our being acutely aware of that. That is what we spend all of our time on—making ends meet.

So we have to assess the flexibility of a V-22 contrasted with other needs, but these various missions of medium-lift and heavy-lift and special operations all have to be fulfilled, regardless of how many bushels of apples you have. But I think that would be better illustrated when we have Dr. Simmons and Dr. Chu seated side by side, Mr. Chairman.

I thank you.

Senator INOUYE. Thank you very much, Senator.

I have invited the gentleman from Texas, Senator Gramm, to join us today, because he has expressed special interest in the future of the Osprey and so with the permission of the subcommittee I will call upon Senator Gramm.

STATEMENT OF SENATOR GRAMM

Senator GRAMM. Mr. Chairman, let me thank you for your kindness to me. I am happy to be here. I have been over at another discussion of the overall budget, and I want to begin by assuring the chairman that I am not going to agree to a budget summit that does not provide a better overall defense number than we adopted at the full Committee on Appropriations yesterday.

Mr. Chairman, I am haunted by the fact that we are in the process of reliving history, in the sense that we are doing today what we did in 1945. We are implicitly assuming that we will never need swords again, as we begin the process of beating swords into plowshares, and I am painfully aware of the fact that within 5 years after the end of World War II we needed swords again in Korea.

A Third World country in North Korea deployed a tank, a T-34 tank, that we did not have a weapon in our arsenal, at least for use on the ground at the time the North Koreans attacked South Korea, that would kill the T-34 tank, and as a result tens of thousands of Americans died due to the fact that we were not prepared.

Now, Dr. Chu, I have concluded in a very short period of time, in listening to Senator Specter ask questions and listening to you respond, that you are not going to be convinced on this subject, but

let me tell you why I am convinced. First of all, I am far more concerned about modernization than I am about the size of the overall force. It is far more important to me that we have a quality force with the best equipment in the world than it is that we have a large force.

I am for the V-22 for several reasons. No. 1, I think it does represent the kind of modernization in capacity that we need to be able to carry out the missions that we are going to be called upon in the decade of the 1990's and in the 21st century to perform. Second, I am very concerned about the technology it embodies, because I really believe that with military production and use we can develop an aircraft for commercial use that can be a godsend to us in terms of commercial transportation.

So in a sense, as an expender of the taxpayer's money, a task I do not enjoy, I get two for one. I get a modern weapons system, better than anything else in the world, that maximizes our capacity to do a job and to do it safely from the point of view of the military, and at the same time I get the development of a new technology that can literally make any little town a town that has commercial transportation, whether they have an airport or whether they do not.

So I understand your position. I understand the budget constraint that we are under. It is a very binding constraint. I personally believe that we are declaring this peace dividend at least 1 year too soon. We do not have a single agreement with the Soviet Union in terms of conventional or nuclear force reduction, and yet we are in the process of having not a defense builddown but a defense meltdown.

I also am old-fashioned enough that while the Bible predicts that the lion and the lamb will lie down together, the lamb lies down with the lion only at the lion's sufferance, and so if the lion and the lamb are about to lie down together, I want to be sure we are the lion, and I see the V-22 as being an important part of that.

So I understand your position. I respect the recommendation that you have made. I just simply disagree with it, and obviously it is our job to take your input, to take the facts as we come to see them, and then to make a decision. I am proud of the fact that the Senate Armed Services Committee provided funding for R&D. I wish we had started procurement, at least at some level. I am hopeful that on the Appropriations Committee we are going to fund the V-22 at least to the degree that the Armed Services Committee authorized. I am going to work for that effort.

Now, obviously, that means less funding in some other area than you would propose. I would pose one question to Dr. Chu, Mr. Chairman. To what degree—and I know this is a difficult question, but I really think it is relevant.

One of the concerns I have, and it may sound a strange concern coming from me, but one of the concerns I have is that so many of our defense decisions are being driven not by life-cycle cost, not by cost in capacity for the whole decade, but by the bottom line in the 1991 budget.

I understand why that is the case, but if you were making this decision where you could have a defense budget for the next 10 years, and look at a decade decision instead of this 1-year budget

decision, to what degree do you think that might affect your decision on the V–22?

MULTIYEAR PERSPECTIVE

Dr. CHU. I think, sir—and I appreciate the chance to hear your views very much—while I would agree with you that taking a multiyear look would change many decisions, in the specific case of the V–22, because so much of the investment cost is in front of us, I do not think it would change things all that much. One really would have to take a much longer perspective.

As I indicated, the break-even point under the small IDA buy is not until about 2010 or so, at least as I understand the numbers, in terms of the hoped-for payoff in lower operating costs, because you buy such a smaller fleet of aircraft in the first place. So one does need to take a very long view in order to get that, to have the salience of the operating cost perspective thrust upon you in a way that might really change the decision.

But I agree with the general principle you are raising. I think many decisions in this context, both by the executive branch and the legislature, would be different if we took a multiyear perspective. I think the Secretary generally would like to take a multiyear perspective and shares many of your concerns, particularly on the modernization front. I think this is just one specific place where he disagrees on a particular choice.

Senator GRAMM. Thank you, Mr. Chairman.

Senator INOUYE. Thank you.

IDA STUDY ASSUMPTION

Before I proceed with my question I would like to make an observation relating to the credibility of IDA. I have been a member of the subcommittee for about 20 years now. During that time I have had the opportunity to read several reports issued by IDA. To the best of my recollection, this is the first time that the Office of the Secretary of Defense has come out with full force to attack the assumptions, the credibility, the results, and the recommendations of IDA.

If I had just walked into this committee room for the first time, and not having had the opportunity of reading other IDA reports, I would have to ask myself what is the Secretary of Defense doing with an organization such as that, that he cannot rely upon.

If you had placed the V–22 on a high priority as a result of availability of funds, would you have still questioned the assumptions made by this report?

Dr. CHU. I think so, sir. That is my responsibility, to question everyone's assumptions. And I think I would draw a distinction between relying on IDA, which the Department does extensively and has done so very happily, as you indicate, for a long period, and necessarily agreeing with the results of specific reports.

This is a report, because it is about a program with so much political salience, that has received extraordinary attention. Never before have we been asked to send a draft report before the final version is completed. We have done so in this particular case because of the great interest in it.

But we, as the IDA staff I think is painfully aware, ask a lot of questions about the assumptions in all their reports. This is one that has spilled over into the public domain. I regret the fact that it has become such a public matter. But we have a frank, candid, friendly, and I think constructive dialog on the entire range of the reports.

We do not agree with every conclusion they reach. This report, in particular, the Congress stressed must be independent. And so our comments to IDA were advisory and not directive in character. They were free to choose what they thought were the best points, and they remain free in writing their final report to do so.

We will obviously make our input and recommend that they look at particular cases and particular changes of assumptions, but it is their call what they put in that report.

CHANGING THREAT

Senator INOUYE. During the past year in my capacity as chairman of this subcommittee, I have either listened to or read dozens of speeches made by DOD officials and military officers on the situation in the world. Just about every speech would begin about the crumbling of the wall and the dramatic changes in Eastern Europe and the demolition of the Warsaw Pact. Then at the same time they speak of the change in military focus to contingency and low-intensity and regional-type conflicts. If that is the case, would not this V–22 be just the type of weapon you would need for that type of contingency, low-intensity regional conflicts?

Dr. CHU. I think Mr. Cheney's view as he has expressed it, is that if he had substantially more money it might be something he would buy. But the problem is, if I might borrow Senator Specter's bushel analogy, we have only one-half a bushel of money, and it has to be made to stretch over the whole range of modernization programs that Senator Gramm identified, including the weapons, most importantly, without which delivering the troops a little earlier, a little faster, a little more safely, will not do any good.

And so the Secretary has made a judgment. Obviously, you and your colleagues may come to a different conclusion, and he recognizes yours is the final conclusion on the matter. But he has concluded that spending as much money as opening this production line and procuring these aircraft would require is not the best use of the Department's resources at this time.

He is clearly in favor of a strong amphibious program. In fact, as I read his initial decision and his reconfirmation of it this year, what he is clearly trying to do is protect enough money so we can buy both ships and aircraft, which the Marine Corps must have. There is, as you appreciate, a big, looming problem with the block obsolescence of amphibious ships toward the end of this decade. If we do not build amphibious ships in the decade of the 1990's, we will not have any meaningful amphibious force as we pass the year 2000.

And that is one of the underlying problems in this debate that the Secretary, in my judgment, is trying to confront. He is not going for quite as elegant a solution in terms of the aircraft portion of moving troops ashore. Obviously, you have the LCAC air-cushion

landing vehicles for a great deal of movement as well. He is reserving funds to buy amphibious ships in this decade.

Senator INOUYE. We are awaiting the resolution of the START agreement, and with that I suppose we will be cutting back on some of the strategic weapon systems in order to bring about a change in military focus on regional and contingency warfare. When that comes about, should we rehabilitate the V-22?

Dr. CHU. People may decide to do so. I do not think the technology will go away. Obviously, there is a cost to restart something, but we have not, as you appreciate, started production yet. The development program is virtually complete. There is not that much more to go. It is a set of ideas you can put on the shelf, and if circumstances later dictate their revival, it is obviously an option we could come back to.

SURVIVABILITY

Senator INOUYE. Do you disagree with the findings of the IDA on the matter of survivability?

Dr. CHU. Not in the following sense, sir. The underlying issue is how often and under what circumstances would the aircraft be exposed to small arms fire. If I recall the results of the study correctly, all the aircraft suffer about the same problems as far as surface-to-air missiles are concerned. And so the differentiating element is the small arms, smaller caliber weapons.

I certainly agree that for any given set of circumstances, you are likely to take more losses with the larger, older helicopters. Now, how many, how important that is, if it's worth the extra money to buy V-22, there is where I think the difference in judgment arises.

Now the modern helicopters we looked at—the CH-60, the Super Puma, the EH-101, and the new helicopter, which I think was really a derivative of a tentative Boeing design, but with IDA's own set of specifications—all have built into them many of the same kind of survivability features that the V-22 has. Maybe not exactly the same set, but they were all designed to be more resistant to small arms fire.

Senator INOUYE. I believe we place greater importance on the relative survivability of these systems and the people who operate within those systems. I, for one, would think that we should be very sensitive to the survivability of personnel. I would hope that when it comes to survivability we would not always apply the bottom line.

Dr. CHU. No, sir; and we do not intend to. But I think the problem for Mr. Cheney is—and let us take the comparison between the Secretary of the Navy's recommendation on this mission area and what the V-22 low profile would require—if he spends $3.7 billion more on this program in the next 6 years, that is $3.7 billion less on something else, including other survivability measures.

Consider one of the kinds of issues that I think Senator Gramm was raising. One of the high-priority items for the Army, and I take specifically the Korean war example, is developing a man-portable effective antitank missile, the so-called AAWSM program, advanced antiarmor warfare system medium. That is a very important program. But the more we debit the defense budget as a whole

for something the Secretary sees as being a lower priority, the less money there is going to be for these other survivability-oriented investments.

It is not that we are trying to apply the bottom line. I think what Mr. Cheney is trying to do is provide some relative guideline here—he would rather see the money go into these other things than into this particular initiative. Again, I would stress what I think is one of the most interesting conclusions of the IDA report: all the alternatives, in general, do better, particularly on this kind of measure, than the fleet we have today.

Senator INOUYE. In our discussion of the first question, you indicated that we may very well revive the V–22.

Dr. CHU. I think I merely acknowledged it could be done. I am not sure Mr. Cheney is about to do so.

TECHNOLOGY OWNERSHIP

Senator INOUYE. Yes; in reference to that question and your response, who owns the technology?

Dr. CHU. That would be a function of the contract terms, and I would have to look into that. I could not answer off the top of my head, sir. I presume the Government has some underlying basic rights, but it is a function of the actual contract provisions.

Senator INOUYE. The question is, If we do not go into production, could the contractor sell that to other countries?

Dr. CHU. I would have to answer that for the record, sir. I would not try to speculate off the top of my head.

Senator INOUYE. I suppose if that is possible, these countries could very well block the United States from using that technology?

Dr. CHU. Not if we already owned it. I would doubt we would wind up in that situation.

Senator INOUYE. Does anyone here know who owns the technology?

Dr. Simmons.

Dr. SIMMONS. No.

Senator INOUYE. I think it is very important in our consideration of this.

Dr. CHU. I assume the contract was well negotiated and the Government owns the technology, but I would want to check before I asserted that.

Senator INOUYE. Any further questions?

I am sorry, I did not see you, Senator Bumpers.

COSTING METHODOLOGY

Senator BUMPERS. Mr. Chairman, I only have a couple of questions of Dr. Chu, and that involves the cost analysis. And my question is whether or not IDA used discounted cash flows in their study.

Dr. CHU. Not really as the principal focus of what they did. They did do some discounted calculations, and they are in their summary report. But the way the alternatives were constructed was to make them equal cost on an undiscounted basis. In other words, in-

vestment costs and the later operating costs of the alternatives were added together, and then compared, without discounting.

Now they have separately done some discounted calculations, but that is not the way, as I understand it at least, the alternatives were basically constructed.

Senator BUMPERS. Are you familiar with OMB circular A-94?

Dr. CHU. Yes, sir.

Senator BUMPERS. Does that not require that you use an assumed cost of money at 10 percent?

Dr. CHU. The Department tries generally to use the 10-percent real discount rate that is mandated; yes, sir.

Senator BUMPERS. Well, the figures have to be flawed, then, do they not?

Dr. CHU. I think that is the essence—and I am trying to avoid a pejorative term—of the Secretary's concern here. His concern is that the V-22 alternative involves high up-front investment costs, which I think IDA acknowledges. As I indicated in my prepared statement, if you bought the same proportion of a helicopter force in this next decade as IDA would do in its low V-22 profile, you would spend far less money.

And so the bottom line is, for rates at which you deliver capability in this decade, you have a lower cost with the helicopter alternatives, and on a discounted basis. I think that was clear in the debate last year at this time on the same issue: on a discounted basis, even with assumptions that tend to denigrate the productivity of helicopters, the helicopter alternatives, in general, look better.

Senator INOUYE. Will the Senator yield?

Senator BUMPERS. Yes.

Senator INOUYE. As I indicated, I will have to leave at this point; I have another hearing to conduct. Will you carry on for me?

Senator BUMPERS. I will be happy to. I may have to leave, too, and I will turn it over to Senator Specter I guess when I have to leave.

Is that OK with you, Senator Specter?

Senator SPECTER. Yes.

Senator INOUYE. Thank you very much.

Senator BUMPERS [continuing]. We will make a hero out of you right here this morning.

Senator SPECTER. After you, Senator Bumpers.

Senator BUMPERS. Dr. Chu, the projected cost of an Osprey is how much?

Dr. CHU. In today's dollars, for the 356-aircraft buy, the average procurement cost, as assumed in the IDA report, would be something like $42 million an aircraft.

Senator BUMPERS. And it would carry 24 fully-equipped personnel?

Dr. CHU. That is the load size for which it is optimized; yes, sir.

Senator BUMPERS. Now what is the cost in today's dollars of a Sea Stallion? We are buying Sea Stallions, that ought to be an easy figure.

Dr. CHU. I would be glad to furnish for the record the costs we are actually paying at the moment.

[The information follows:]

In fiscal year 1990, we are buying 10 CH-53E's at a cost of $199.9 million, plus $51.7 million for initial spares. This yields a total cost of $251.6 million, or $25.2 million per helicopter. The unit flyaway cost is $18.0 million per aircraft.

Dr. CHU. In the IDA study, the CH-53E+ was priced at $25 million in fiscal year 1988 dollars, and you have to add about 10 percent to convert that to fiscal year 1990 dollars. The CH-46E+ was priced at $15 million. These are the prices implicitly that we see as being used in the study. And the stretched CH-60 that was mentioned was priced at just over $11 million.

Now those aircraft, because of the ground rules of the IDA study, all include the more expensive avionics package, the $2.5 million package. One of the issues in whatever program goes forward—and an issue on which the Secretary has already come down once on the low side—is whether the Department is going to buy that expensive an avionics package, or whether we will limit any buy to the kind of avionics package the Army is currently buying for its Black Hawk helicopters, which costs about $700,000 a copy.

Senator BUMPERS. You said the CH-53E?

Dr. CHU. The CH-53E+, which is a variant of the CH-53 used by IDA in the study.

Senator BUMPERS. And how many men will it carry fully equipped?

Dr. CHU. You are probably up in the 30-something range.

Senator BUMPERS. It is really over 40, is it not?

Dr. CHU. Probably so. The CH-47, which is roughly comparable carries 42, I remember offhand, and I would have to look up the CH-53.

Senator BUMPERS. Let me tell you that I do not have a dog in this fight. I am really trying to objectively decide how I am going to vote on this because I like to give the Marine Corps pretty much what they want. I cannot avoid that prejudice. But on the other hand, I am inclined, simply because Secretary Cheney has found something he can do without, to support him.

Dr. CHU. He appreciates that.

Senator BUMPERS. We hammer on him all the time to do these things, and when he does it, we say, well, you picked the wrong thing. You have got to guess again. So I really want to find out on a cost basis, and also on a military basis. The Marine Corps insist they need it and they want it. They may not insist on that to the Secretary anymore, but that is my belief on their feelings. But when you talk about $42 million to carry 24 as opposed to $25 million to carry, say 42 fully-equipped people, then you have to have some combat capabilities with the Osprey, or some commercial applications under which the U.S. Government would recover some of its cost, which is what Senator Inouye was apparently driving at. Otherwise, it is not a good deal.

And incidentally, if you do not do the discounting, cash flow discounting, as required by both OMB and DOD, DOD has a directive that 10-percent discounting will be used also. I cannot quite figure out why IDA did not do that in this instance, but if you are starting out discounting $42 million and discounting $25 million, obviously, the discount has an effect that is sort of favorable to the Osprey, does it not?

Dr. CHU. Well, discounting actually will be unfavorable to the Osprey.

Senator BUMPERS. You get a lot bigger discount on $42 million than you do on $25 million.

Dr. CHU. In that sense, yes sir, but of course, the problem is that the Osprey's costs are all up front.

Senator BUMPERS. That is what we are talking about.

Dr. CHU. That is the essence of Secretary Cheney's problem. It is a big up-front cost, and his view is you just cannot bear that.

OPERATING RANGE

Senator BUMPERS. Your chart here—is this your chart? Well, in any event, of course, it just shows that existing helicopters have a 75-mile limit coming off aircraft carriers, whereas the Osprey would have 400 miles. Now, that is a big difference and that gives a force projection that is very appealing for the Marine Corps and the Navy, but the question is, if you do not have the helicopter gunships and the heavy lift helicopters that you are going to have to have to participate in an assault, where does that leave you? You have a V–22 Osprey with assault troops that can go 400 miles, but you do not have that capability with the support forces. How does that play out?

Dr. CHU. In fact, sir, I think the point is even stronger than you have offered it. The real limit here is the operating range of things like the LCAC, the air-cushioned vehicle bringing marines ashore. So, you are not going to operate at extreme ranges in any event, except perhaps for small raids. The helicopter figure that you cited is much lower than the kinds of operating radii you can get, particularly with the bigger helicopter.

If you look at the CH–53E, for example, carrying troops only, you are probably talking about something like 200 nautical miles. With the CH–60, it depends on which model you are going to buy, but I think the manufacturer of that helicopter would argue it could get a 140-nautical mile radius with some of the improvements the Army is currently putting into it. I think a number of 75 miles or so is consistent with today's fleet, which, of course, is what Mr. Cheney wants to replace with better, newer helicopters, which he feels do a good enough job. Granted the V–22 might do an even more elegant job, but as you pointed out, there is this big up-front cost that has to be swallowed. In his view, that is more than the traffic can bear.

But you are absolutely right, the force as a whole is going to be tied to a much closer point to the shore than the extreme operating range cited for the V–22.

BREAK-EVEN POINT

Senator BUMPERS. Dr. Chu, you probably could not give me the number just off the top of your head, but you had stated that the break-even point on the Osprey occurs in the year 2009 or 2010, and that is obviously without discounting.

Dr. CHU. That is an undiscounted calculation, that is correct.

Senator BUMPERS. I would like to ask you if you can answer it, fine, if you cannot, I would like to ask you for the record, if you use

discounting, which I think you ought to do. I think the figures are seriously flawed if you do not count what it costs the Government to borrow the money to build this thing with. I would like to know where the break-even point would be if you used discounting.

Dr. CHU. I will be glad to do those calculations for you, sir.

[The information follows:]

The answer to your question hinges upon assumptions concerning the rate at which the helicopter alternatives are procured. In the IDA study, the helicopter forces are purchased at rates much higher than the V-22. For example, over the fiscal year 1991-97 period, 326 CH-60(S) and CH-53E+ helicopters are procured versus only 86 V-22's. I would argue that a more meaningful comparison would address helicopter procurement rates that yield the same lift capacity as the V-22 over time. Under these assumptions we would procure only 86 CH-47M or 103 CH-60(S) and CH-53E+ helicopters in the fiscal year 1991-97 period. When discounted, the cost stream for the 356 Marine Corps V-22's never breaks even with corresponding equal lift acquisition streams for the CH-47M or the CH-60(S)/CH-53E+ alternatives.

If we simply discount the cost streams for the front-loaded procurement profiles assumed in the IDA study, the 356 Marine Corps V-22's and the alternative aircraft compare as follows: Again, the V-22 never breaks even when compared with the CH-47M; and the V-22 breaks even in fiscal year 1996 when compared with the CH-60(S)/CH-53E+ alternative. But, as previously noted, this break-even point is driven purely by the high up-front production rates assumed in the IDA study.

Senator BUMPERS. It is going to be further out, is it not?

Dr. CHU. In fact, last year at this time, when we examined different profiles—I want to be careful not to assert that this would necessarily be true now—on a discounted basis, the V-22 never broke even with the helicopters.

Senator BUMPERS. Incidentally, I was wrong a while ago when I said I favored the Osprey. I meant the very opposite.

Senator SPECTER. Would you yield for just a moment, Senator Bumpers?

Senator BUMPERS. Certainly.

Senator SPECTER. On the issue of discounting, the information provided to me is that the Institute of Defense Analysis did do the discount. We have the IDA people here.

Senator BUMPERS. Could somebody here, I think since I am heading up this ship right now, I will just ask who is here from IDA? Could either one of you gentlemen, just where you are, tell us whether discounting was used or not?

Dr. SIMMONS Yes, sir; we discounted the cost for all of the alternatives at the OMB directive rate of 10 percent per year, and we have compared the alternatives in that way, as well as using the constant dollar cost, which Dr. Chu has mentioned.

Senator BUMPERS. And you used discounting in the comparative analysis? Were there any other alternatives to the Osprey?

Dr. SIMMONS. Yes, sir; the cost summary that we show in the executive summary of our report shows the near-term cost and the discounted cost for all of the options.

Senator BUMPERS. Is the Sea Stallion the closest alternative to the Osprey for the mission? If you did a comparative study, what did you compare the Osprey with?

Dr. SIMMONS. We compared it with seven different helicopter alternatives, Senator.

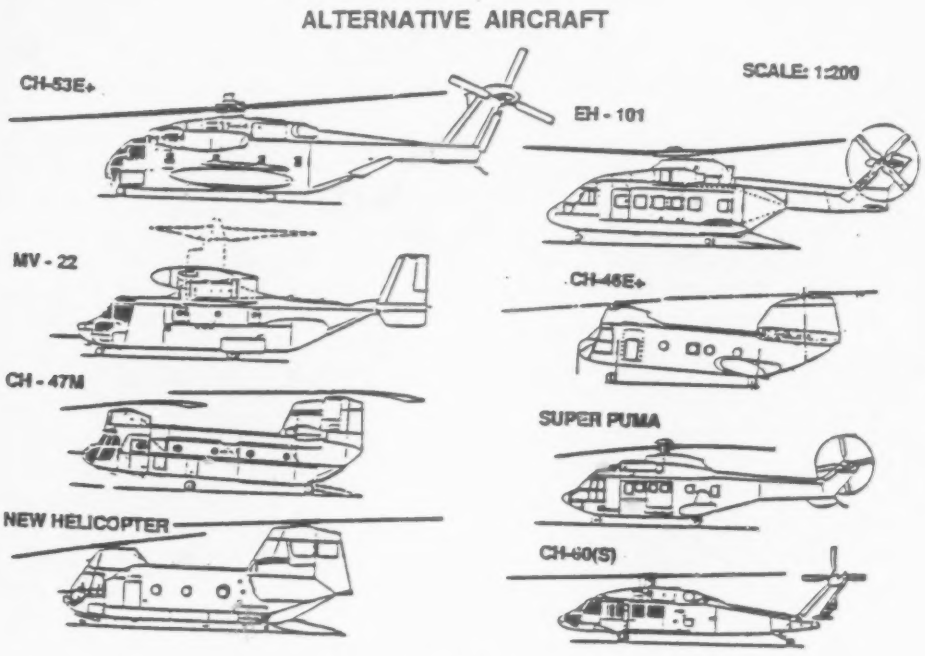
Senator BUMPERS. Why do you not identify yourself for the record, please.

Dr. SIMMONS. Dr. Simmons from IDA. I presented a statement earlier this morning.

Senator BUMPERS. I am sorry, Dr. Simmons, I was not here for that, but go ahead.

Dr. SIMMONS. I guess the easiest way would be to present a couple of the view charts that we showed earlier.

Senator BUMPERS. Be my guest. Dr. Chu, you pardon us for a moment here while we do this.



SLIDE 6

Dr. SIMMONS. Senator, here is a picture of all the alternative aircraft we compared against the V-22 in our assessment. The V-22 is shown here, the CH-53, the Army CH-47, a new helicopter modeled on Boeing's model 360 technology demonstrator, the British Italian EH-101, the Marine's current CH-46, the French Super Puma, and the Army CH-60, and in the case of these four smallest, the smallest of the helicopters, they are not large enough to carry the Marine Corps' equipment that the V-22, the CH-47 and the new helicopter could carry. So, with these four alternatives, we paired those in varying numbers with the larger CH-53E, which would have to carry those equipments for those options.

Senator BUMPERS. You are talking about equipment; how about men?

Dr. SIMMONS. All of these aircraft could carry the troops.

Senator BUMPERS. But only those on the left could carry the equipment?

Dr. SIMMONS. Yes, sir; only these four can carry the equipment.

Senator BUMPERS. You heard the discussion awhile ago, how many fully equipped men can a 53E+ carry?

Dr. SIMMONS. The CH-53E+, by our measurements, could carry 35 combat-equipped marines, and that would give them the same space per marine that they would have in the V-22 or the CH-47, which Dr. Chu correctly pointed out, could carry 42 combat-equipped troops.

Senator BUMPERS. Dr. Simmons, what do you get for the 400-mile range as opposed to the 75-mile range? I can understand one part of that. For example, if you were going to undertake an assault, you could launch 400 miles out, even though the carrier, for example, was headed toward the assault point. You could launch early with an Osprey and then keep steaming toward the point of the assault. But, as I say, does that make sense to do that and get your equipment there as late as say, 3 or 4 hours after the assault has begun?

Dr. SIMMONS. No, sir; but those numbers are not the numbers from our assessment. The numbers that we used for the amphibious assault are comparable to the numbers that Dr. Chu was citing earlier—on the range of 200 miles for the V-22 and for the CH-53E. The range for the air-cushioned landing craft is approximately 100 miles, so that is, in fact, the constraining factor. We developed in detail as part of our assessment, concepts for the amphibious assault in which the ships would stand 25, 50, and 100 miles offshore, and those distances would be compatible with the ranges of all of these aircraft. In some cases, it would adversely affect the payload and that difference was taken into account, but all of these aircraft could conduct amphibious assault from ships as far away as 100 miles.

Senator BUMPERS. Well, just generally, from a military standpoint, how much is the advantage of a 400-mile range, for example, being able to launch 400 miles out as opposed to 100 or even 200?

Dr. SIMMONS. Again, I think I would tend to agree with Dr. Chu that that kind of difference is more likely to have an effect in smaller scale operations, such as the small combat raid, and we, in fact, analyzed that kind of operation in our assessment. So, it is a combination of the longer range and the greater speed of the V-22 that would enable it to reach a point 400 miles away considerably faster than would be the case for a helicopter. So, I think there would be some time advantages.

Senator BUMPERS. Because of the speed?

Dr. SIMMONS. Because of the speed and load-carrying capacity.

Senator BUMPERS. Thank you very much, Dr. Simmons. You know, I have always admired the Pentagon's ingenuity in picking a new mission. I mean, once peace breaks out in Europe, all of a sudden we are told that the Third World threat is just as big, and I must say that has some merit. It does not justify a $300 billion budget, but it certainly has some merit, and if you read the paper this morning, I think that there was an omen in this morning's paper which you are going to see more of, if you live long enough, you may see it come to fruition, and that is, Saddam Hussein threatening the Kuwaitis and accusing them of stealing oil. Now, here is a country that provided Iraq with over $30 billion in equipment to fight Iran with, and literally was the difference in the outcome of that war, and Hussein is now turning on them, accusing them of stealing oil, accusing them of overproducing their OPEC

allotment. And I must say, and I think probably Gary Hart, who was a friend of mine, came to the Senate with me, would be pleased to hear me say this, he said all the time he was in the Senate, that this is the kind of thing in the Middle East that was going to occur with increasing frequency, and that ultimately, the United States would wind up going to war over oil in the Middle East, and he used to be a great conservationist and try to limit our dependence on Middle Eastern oil so that we could avoid that.

We have not, and in my opinion, probably are not going to, but at some point when our principal suppliers in the Middle East are threatened by a neighbor, I think you are going to see the United States defend our oil supplies there for all the obvious reasons I will not belabor, and I think it will come within the lifetime of an Osprey. I do not mind telling you that in the back of my mind, I think about that and I will think about that as we deliberate and mark this bill up and decide what we are going to do about the Osprey.

A $2 billion savings is a tremendous amount of money. We need to save it, everybody knows that. But I also think that that is the kind of thing we are going to be engaged in in the future. There will be much smaller wars than something on the plains of Europe, but we have got to have a capability, and as I say this morning, it is just sort of the tip of the iceberg. You may not see anymore for a year, 2 years, 5 years, but ultimately, you are going to see more and more of the kinds of thing you saw in the Post this morning with Hussein threatening Kuwait. Kuwait is defenseless. They do not have an army that could even come close to defending themselves against Iraq.

Well, that is my sermonette for this morning, Dr. Chu. I thank you and Dr. Simmons both.

Senator Specter, have you already asked questions?

Senator SPECTER. I have and was expecting now to yield to Senator Lautenberg.

Senator LAUTENBERG. Just for a couple of minutes. I thank you, Mr. Chairman. I could not help but note with interest your closing remarks about things we might be fighting for or fighting about. You talked about oil, but you can get oil in different places. The one thing you cannot get in different places is water, and you will see the tensions heighten up considerably in the Middle East over water, not quite to the extent they are between California, let's say, and Nevada or Texas.

So there are plenty of items that would cause us to respond to sporadic but significant opportunities or challenges, and I think the V-22 presents us with the kind of flexibility, the kind of speed, the kind of facility that frankly, is best suited to these kinds of operations.

I will not take the subcommittee's time, having arrived late, but I would ask Mr. Chairman for the record that an opening statement that I would have made—a rather eloquent one, but brief—be included in the record.

Senator BUMPERS. Since it is eloquent, it will be admitted.

[The statement follows:]

STATEMENT OF SENATOR LAUTENBERG

Assistant Secretary Chu, Dr. Simmons, thank you for taking the time to appear before the subcommittee to discuss the Institute for Defense Analysis study of the V-22.

As someone who has believed for a long time in the benefits to our national defense and to our bottom line of buying the V-22 instead of any other helicopter, I am extremely pleased with the results of this study.

Opponents of continued procurement of the V-22 will have to answer why a system that has been found by an independent study to be more effective—sometimes significantly more and other times only slightly more—than all the proposed helicopter alternatives in each of the four Marine missions examined, is not worth the money.

They have to tell us why, when even procuring 356 V-22's in a lower cost fleet yields substantial improvement over the Marines' current capabilities for all missions, we should not buy the V-22.

They need to enlighten us as to why, when the V-22 is the most cost-effective alternative for Navy combat search and rescue, air force special operations, and drug interdiction missions, the V-22 is not the system of choice.

I want to say for the record that I believe we do need to cut the defense budget to reflect the new world in which we live, and the reduced threat.

But I do not believe that we will be able to make those cuts by canceling a system that, for the same money as other alternatives, provides much more bang for the buck. I intend to fight to see that we provide funding for the V-22 this year.

Thank you, Mr. Chairman.

Senator LAUTENBERG. The other thing is, I have a couple of questions for Dr. Simmons, and again will put those in writing to you, Dr. Simmons, and Dr. Chu, and thank you very much for the opportunity. Thank you, Senator Specter.

Senator BUMPERS. Thank you very much, Senator Specter.

Senator SPECTER. I yield now to Senator Kasten.

Senator KASTEN. Thank you, I have no questions.

COSTING METHODOLOGY

Senator SPECTER. Dr. Chu, Dr. Simmons, Dr. Randall, if you would all three come to the table at the same time, please.

Now that you are surrounded, Secretary Chu, let me begin with the subject of the very diversified mission list. Actually, before I do that, since Senator Bumpers had dealt so deeply into the discounting issue, this chart had showed the discounted cost for all of these various helicopters. I would ask Dr. Chu, had you not noted that the IDA study had made the appropriate discounts?

Dr. CHU. I think perhaps I did not express myself very well, but what I tried to say was that in constructing the alternatives, IDA did so on an undiscounted basis. Now, at the end of the day, particularly when it came to drawing up the summary report and looking at slower procurement profiles, as well as during the course of the study, they looked at what the discounted numbers were for some of the alternatives.

But I think the main point I would stress is, if we look at the table I believe you are referring to in the summary report, helicopters are being bought in that table at a rate disproportionate to the rate at which V-22's are being bought—that is to say, relative to the eventual goal for each type of fleet, so it is not an apples-to-apples comparison in terms of capability of the fleet.

The central point I was trying to get across is that the alternatives were designed, at least as I appreciate it, to be equal cost on

an undiscounted basis, with 20 years of operating support costs assumed for the various aircraft in the fleets.

IDA did not start with the perspective that the discounted present value had to be the same for the alternatives.

Now, ex post—as I read the report—various discounted sums were computed, but the point I was trying to stress is that in thinking about the problem, so to speak, this was really done on an undiscounted basis.

Senator SPECTER. Secretary Chu, I do not understand your answer. The chart plainly indicates that they discounted the costs. Did you not know that?

Dr. CHU. Yes; absolutely.

Senator SPECTER. Excuse me, wait until I finish my question. The chart is categorical. Discounted costs. Did you know that the costs were discounted when Senator Bumpers asked you that at some length this morning?

Dr. CHU. Absolutely. I think if we read back my words, you will see I carefully tried to differentiate between the issue of how the alternatives were constructed, which is what I was really responding to, or trying to respond to, and the question of whether or not there were discounted numbers anywhere in the report.

There certainly are discounted numbers in the report, and I also tried to stress in that answer and others that the procurement profiles in the summary, which are somewhat different from the profiles in the report, I would acknowledge, buy helicopters at far higher rates relative to the total helicopter fleet size being acquired than they buy V-22's. So it is important in thinking about discounting to discount not only the cost but also the benefits. One has to pay some attention to the rate at which capability is being delivered, not just the rate at which dollars are going out the front door.

V-22 MISSION

Senator SPECTER. Well, I did not understand that answer either, but I will reread it. I am going to move on, now, to another question.

Dr. Chu, I am advised that in 1984 you signed a memorandum which was the subject of a congressional action item on the JVX mission list, which is the predecessor name of the V-22 Osprey, and the memorandum which you submitted was in response to a request from this committee. That memorandum listed 26 additional potential future missions for JVX and contained the following in the DOD position statement which you had prepared, according to the information provided to me:

> The Department recognizes the utility of aggregating the potential for the tiltrotor concept in the form of the JVX mission list. There is no question that if the JVX lives up to its potential it could have significant applications to many more missions than those for which it is currently being deployed.

So there you have a situation: in 1984, the Congress was told that the JVX, which is the same as the V-22, had extraordinarily broad mission potential, and of course last year we were told by the Department of Defense that the V-22 program should be canceled be-

cause it is not affordable for the narrow mission area of marine assault.

Especially in the context of the questions which we have had here from the chairman and Senator Bumpers and Senator Lautenberg, why does the Department of Defense insist on presenting its evaluation on the narrow mission grouping of the marines, as opposed to the 26 missions listed before and the many more operations which have been specified in the IDA report and commented about publicly?

Dr. CHU. I think the central element of the answer, sir, is that at the time the program was canceled by Mr. Cheney last year, something like 80 or 85 percent of the V-22's proposed were to be bought for the Marine amphibious assault mission.

I think everyone understood that if the aircraft cannot pass the test of that mission, if it does not look sufficiently attractive to be worth the investment, the risks, the uncertainties, then the Department and others are unlikely to be very interested in it for the other missions.

Those other missions exist. Obviously, if the V-22 is bought for the amphibious assault mission—I think this is the point we were making in the early to mid-1980's—once you have made that basic decision to buy it for Marine amphibious assault, then a variety of other missions, much smaller in character and more limited in extent, are going to see its application. In all of those missions, though, you are going to have the same problem that confronts Mr. Cheney in terms of his decision, as recently reaffirmed, which is the initial procurement cost of this aircraft. It is a relatively expensive platform. It is a transport platform, in the end.

STUDY ASSUMPTIONS

Senator SPECTER. Secretary Chu, I have been surprised by the Department of Defense's response to the IDA report challenging the assumptions which IDA made. Dr. Simmons has already testified that there were many, many occasions—I think five—when the Department of Defense not unexpectedly had access to the Institute for Defense Analyses without any congressional input.

It has been represented to me, and Dr. Simmons can amplify on this, that the Institute for Defense Analyses painstakingly complied with all of the requests made by the Department of Defense Steering Group with respect to the study and ran over 400 excursions at the request of the steering group to look at conservative assumptions on the Osprey, although that was not done on the alternatives, really suggesting that every effort was being made by the Institute to give every fair range to the predisposition of the Department of Defense.

No matter how many assumptions the Department of Defense asked the Institute to undertake, and looking at all of these items—and we are going to get into those in some detail— they could not come to any other conclusion than V-22 Osprey superiority.

But let me begin with you, Dr. Simmons, as to that question of assumptions, where your conclusions have been challenged on the basis of the assumptions, and ask you to describe or verify or con-

tradict my assertion as to the 400 varieties that you undertook at DOD's request on all the conceivable assumptions which might have shot down the V-22 Osprey.

Dr. SIMMONS. Yes, sir; that is a number that I think is, in fact, reported in our study report. It applied to the number of variations in parameters that we examined in particular for the amphibious assault mission, and applied not only to the V-22 but all of the helicopter alternatives.

I think we made an extraordinary effort in the study to respond to all of the direction that was provided by the steering committee, not only suggestions made by the OSD staff, but suggestions made by the Department of the Navy and Marine Corps representatives on the committee, the OSD special operations and low-intensity conflict representatives. As I mentioned earlier, one of the reasons that our report is of the size it is is that we examined a tremendous number of variations in all of the key parameters which we thought, or which the steering committee or the IDA review committee that went through this study in detail, thought could influence the results. I think a lot of the assumptions that Dr. Chu challenged us on earlier are examples of factors which, in fact, were varied in the report, although the results of all of those were not reported in detail in the 25-page executive summary we prepared. In doing that, one always has the conflict of trying to make something understandable to the executive-level reader without indicating all of the details that were examined.

Senator SPECTER. But you did examine all the details and all the assumptions?

Dr. SIMMONS. Yes; we did, and specifically all the points that Dr. Chu mentioned this morning—the higher speed with external cargo, the small HMMWV, as it is called, aircraft reliability, the number of troops carried, whether that was 24, 35, or 42, the way you might double-sling the HMMWV under some of the aircraft—all those issues were examined in the sensitivity analyses of our study. Similarly, issues regarding aircraft survivability, map-of-the-Earth flight operations for the helicopters, and using the longer range of some of the aircraft to avoid threat locations, using additional fire support assets, tac air, naval gunfire and so on—to suppress enemy air defenses—just an example of the tremendous range of situations, variations that were considered in our assessment.

Dr. RANDALL. There is one point I would like to add to that, Senator Specter, and that is, as Dr. Chu indicated, the nature of the steering group. We took comments and suggestions from them and if we felt they had technical merit and promised to affect the results of the study—that is, the comparison of the alternatives—we then set about to do the analysis they requested. I would like to stress, however, that the final judgment as to how the calculations were done and how the results were then presented was IDA's.

Dr. CHU. I think what is important to stress, and the main point I was trying to convey, is that like any study, the results you get derive partially from the assumptions you make. What you have in the summary report are a selection of those results.

What I have tried to emphasize is, if you made a somewhat different set of assumptions, including putting together some assump-

tions that were not necessarily run as a package but were run individually in some cases—and that is how we got the insights as to how these assumptions might affect the results—you would reach a somewhat different conclusion.

Senator SPECTER. Dr. Simmons, do you think that the assumptions which Secretary Chu articulated this morning—the dual-sling issue, No. 1, the trips, No. 2, the sequence of troop as opposed to equipment movement, the small truck assumption—would have made any difference?

That is, you took all the assumptions that Secretary Chu and others from the Department of Defense offered you, and you gave very substantial consideration to all of the assumptions which Secretary Chu and Secretary Cheney and the others wanted you to consider, and after you considered them, you came to the conclusion of V-22 Osprey superiority. What do you think of Dr. Chu's—well, what is the right word?—attack on your conclusions through manipulation of the assumptions?

Dr. SIMMONS. I guess I would simply say as the project leader for this task aided by a large team of analysts from IDA, as a group we arrived at these conclusions. We presented them to our review committee at IDA. In some cases, they made suggestions as to how they might be better worded. We stand behind the report as we presented it to the Department.

We are certainly willing to listen to suggestions that Dr. Chu or his staff might have as to how we might correct statements of error if there are those in the report. We have tried hard to make certain there are not, but there is always that potential.

If they think that there is some other set of the voluminous amount of data that is reported in the back end that might present a completely different conclusion, if it were brought forward, we will take that into consideration.

I think the one summary chart that we presented for the amphibious assault mission that is shown in the executive summary of the report, which I showed you an unclassified version of that chart in my short briefing this morning, captures the range of differences. If you make all conservative assumptions as to how the aircraft might be used, that survivability differences will not be too important given the specific conditions of the assault, that you carry two HMMWV's under each CH-53, that under those conditions the V-22 still had a slight advantage.

If you make other assumptions about the conditions of the assault or how the equipment is used, the V-22 has a more pronounced advantage, and there are considerable disagreements between the Department and, for example, the Marine Corps, say, on the issue of whether or not it would be wise to double-sling all of the HMMWV loads, that have yet to be resolved.

As Dr. Chu correctly pointed out, that concept has been tested by the Marine Corps, and they are obviously interested in it because the CH-53 is a large aircraft and they would like to take full advantage of its payload. At the same time, as the Commandant has pointed out, they have concerns about their ability to make the connections aboard ship, perhaps in rolling seas, most likely at night without lights on the ship deck to give away their position, whether they could do that safely, and whether or not there would

be problems or risks to the crews of the vehicles in terms of disconnecting them once they are on land.

In order to carry two HMMWV's, for example, under the aircraft they have to be connected physically together in some way to turn them into a stable aerodynamic load that could be carried by the aircraft.

We tried in our assessment as an independent, objective, open-minded outside party to present the full range of excursions in all of these cases to show what would happen if each side's assumptions were true. The Marine Corps argued that they would prefer not to double-sling any loads. OSD for different reasons would prefer to have all of the loads double-slung.

Similarly, in terms of the number of troops that you might load into the aircraft, if you load 24 troops, then when the aircraft is lost you lose more troops when you do that. So there are pros and cons and reasons for disagreement for all of these factors, and we have tried in our assessment to report the full range of conditions that we examined.

Senator SPECTER. So when you consider all the assumptions that the Department of Defense, Secretary Chu, presented, even the double-slinging, you found the V-22 Osprey have some advantage, and you used other assumptions that you thought more likely that the advantage of the V-22 expanded?

Dr. SIMMONS. Yes, sir.

Senator SPECTER. Let us take up the dual slinging for just a moment, Dr. Chu. We cannot go into all of these assumptions without, perhaps, duplicating the 1,200-page report in 1,200 hours, but you have insisted on the dual-slinging option being considered. Dr. Simmons and the Institute concluded that even using your projection it still left the V-22 with an advantage.

You had General Gray testifying on this subject as follows: "With all due respect to Congressmen and for my colleagues from the Pentagon, I consider this whole dialog on the dual-sling options totally ridiculous."

Even if you take it your way on what the Marines say is a ridiculous alternative and you still have the V-22 superiority, what can you realistically and reasonably say to undercut Dr. Simmons' conclusion?

Dr. CHU. Let me come back to the main point I am trying to make here. It is not my agenda to attack the IDA report. It is an independent report, as the Congress requested, and I think, as its findings suggest, that the Department clearly did not dictate to IDA. I think Dr. Randall underscored that.

It was their final judgment on which cases to run, which combinations of ingredients to present, which combination of ingredients in their judgment make sense. I am not trying in any way to be unduly critical.

What I am trying to underscore is, as I think Dean Simmons' statement stresses, if you make one set of assumptions, you get under his ground rules a modest advantage for the V-22. What that suggests to any analyst is, you change some of those assumptions slightly and V-22 is certainly going to lose. For example, the cost goes up. V-22 is a program in front of us. The cost has already gone up substantially. The aircraft is alleged to have a weight

problem, which means a cost problem in the long run, and further development activity.

So the only point I am trying to make is that the conclusions one draws in this debate are going to be driven by the assumptions one makes. If you make a different set of assumptions, you are going to get a somewhat different set of results.

I think it is important in looking at these studies—and having had the privilege of looking at a large number—to put in perspective claims about improvements. In general, the Department has not pursued systems that do not promise dramatic improvements. The reason is obvious; that is, new systems always have great uncertainties, risks that you do not know about, the so-called unknown unknowns—cost risks, schedule risks, technical risks, performance risks. So one always wants a nice, comfortable, large margin before one leaps off into a big new area, particularly as is the case here, where there is a large investment cost up front.

DUAL-SLINGING

Let me come specifically to the dual-slinging issue and to General Gray's comments. I have not read them in their complete context, and I, therefore, do not want to be unfair to General Gray, but I think it is important to note that whereas a year ago the Marine Corps position was never to do this—that was their essentially stated view—their most recent lift study does acknowledge that about one-half the time they could see that as being an appropriate approach, and in the V-22 study done by IDA, their central core case does involve dual-slinging half the time.

The only point I am making is, having already bought a large number of helicopters—the CH-53 specifically—for the heavy-lift mission, which the V-22 cannot do, the CH-53 specifically, we are not utilizing those helicopters to their maximum advantage if we do not push dual-sling loading.

I think the general point I would offer in terms of thinking about the whole problem here is that unless we are willing to vary several elements of what is now seen as doctrinally limited, not just some elements but many elements, we cannot possibly get through this next decade with the kind of funds the Department is going to live with and have meaningful force structure modernization of the sort that Senator Gramm pointed to as being the kind of objective we should be aiming for.

NATURE OF DISAGREEMENT

Senator SPECTER. Earlier today, the chairman of the subcommittee, Senator Inouye, said that in the 20 years that he has been here he has never seen such disagreement between the Department of Defense and the Institute of Defense Analyses.

Dr. Simmons, in your somewhat lesser tenure have you ever seen such a disagreement?

Dr. SIMMONS. I guess I would, if I could, defer that question to Dr. Randall, if he is willing, perhaps to give a different perspective. As you point out, my tenure at IDA has been about 8 years. I think there have been disagreements before. This one, perhaps, is more public than any of the disagreements that we have had on other

studies because of the interest that the Congress, the Senate, have in this aircraft.

Dr. Randall?

Senator SPECTER. Before you defer to Dr. Randall, I would like your answer as to whether there has been anything as profound as this disagreement?

Dr. SIMMONS. No; I think there are. I think there have been other cases where various of our sponsors within OSD, the Joint Staff, have disagreed with the work that IDA has done.

I think one of the factors that we all have to accept in the existence of an organization like IDA that tries to be objective, open-minded, independent in its analyses is that on some occasions we will produce reports, studies that agree with the programs that have been developed in the Pentagon by the OSD staff or the services. At other times, I think because we are independent, we will have results that disagree. I think this happens to be one of those occasions. It is simply the price we pay for maintaining an organization like IDA.

I think it serves a useful purpose. Here we have certainly highlighted a lot of the issues that are important for the consideration of the V-22 program, and it provides a vehicle perhaps for doing that. It is not necessarily a pleasant circumstance to be in as an IDA analyst, but I think it is one that we have to live with if this is the type of job that we propose to do, I think, for the benefit of the Department of Defense and the U.S. Government in total.

Senator SPECTER. Dr. Randall, would you care to supplement that answer?

Dr. RANDALL. I think Dean has given a very thorough answer. I would agree with what he had to say. I think it is the nature of an FFRDC like IDA—if it is to be truly objective—to occasionally come up with results that are not in consonance with the Department's view.

I might say in many instances in the past, it is not clear that the Department's view is homogenous, either. So it is possible to be in agreement with parts of the Defense Department, that is with some of our sponsors, and in violent disagreement with other parts.

Senator SPECTER. You say, Dr. Randall, that there is not agreement within the Department of Defense?

Dr. RANDALL. I am not addressing this specific issue. I think on some of our prior studies that has clearly been the case.

Senator SPECTER. Even on this issue with respect to the Marine Corps' view, is it not?

Dr. RANDALL. That is my understanding, sir.

Senator SPECTER. Very diplomatically articulated. [Laughter.]

It is too late to make this short, but I am going to try not to prolong it any more than absolutely necessary.

SAVING LIVES

We come to the issue of saving lives. Again, I reference the chairman's statement that he hopes we do not look at the bottom line. I asked Secretary Chu about savings lives in Panama. He said he did not know about that. We talked about the rescue mission for the hostages in Iran back in 1980, but let us limit it specifically to the

report with this statement about which I have already asked Secretary Chu.

"The large CH-53E and CH-47M helicopters are 1.7-to-3.5 times more likely to be downed by enemy air defenses than is the V-22."

I consider that to be a very highly significant conclusion, Drs. Simmons and Randall, because we are talking about saving lives. Secretary Chu disagrees with that.

What do you have to say, Dr. Simmons, by way of factual analysis to support this very important IDA conclusion?

Dr. SIMMONS. I think, again, I would harken to the broad range of conditions that we examined. One entire chapter and a large portion of the research effort was devoted to the issue of aircraft survivability. We recognized it would be very important from the beginning of the study, and, in fact, I think this is the first assessment of the V-22 of all of those that have been made over the years that have specifically included the differences in survivability.

Again, the results that we brought forward to the summary are a distillation of what we think would be the most likely situations in which the aircraft would be used: the difference between day and night operations and flat and rolling terrain.

Again, we stand behind the results that we have shown in our report. We think that the V-22, given the features that are being designed specifically into that aircraft, particularly redundant systems, wide separation between components and so on, would make it more survivable particularly than the older larger helicopters. Some of the smaller helicopters, the more recently built ones, under some circumstances would be comparably survivable to the V-22.

Dr. RANDALL. If I might add just one thing to that, Senator. It is important to realize that those survivability differences are built into the amphibious assault results. So the loss rate for the helicopters and the V-22's as shown in the amphibious assault calculations have the survivability differences built into them.

COST COMPARISONS

Senator SPECTER. Dr. Simmons, I had asked Secretary Chu the question about the V-22 program costing $3.7 billion more than the Secretary of the Navy had budgeted for medium lift aviation, which was the statement in the cover letter which made it appear that the V-22 was much more expensive. You testified about other operations which would have increased the range of $2.3 billion to $4.4 billion, the heavy lift and special operations illustratively.

Secretary Chu spoke of comparing apples to apples, and I said there were two or three bushels there. Is it not a fact that if you take into account all of the missions of the V-22, that is heavy lift and special operations, as well as medium lift, that the total cost for the V-22 is comparable, if not less than the alternative?

Dr. SIMMONS. I think both you, Senator, and Dr. Chu are correct in the specific statements that you have made. Your statement, Senator, referred to the alternatives as we have constructed them. Dr. Chu, as I understand it, is discussing the alternative that is in the current Navy program and it is considerably different than the

program that the Office of the Secretary of Defense put forward as an alternative to the V–22 when that aircraft program was canceled. Those numbers are relatively new. They were not available at all during the course of our study. If the numbers that Dr. Chu has discussed had been available, perhaps we would have constructed a different set of alternatives or different funding profiles, and I understand that some of his staff people are looking at such alternatives at the present time.

So, there are almost an infinite number of ways of planning out these programs and deciding how much money has to be allocated, and it is possible to add the numbers up in different ways.

Senator SPECTER. Secretary Chu had full option to give you all those alternative figures had he chosen to do so.

ALTERNATIVE FUNDING

Dr. SIMMONS. No, sir; those numbers were simply not available. The Navy had not developed that alternative funding program, and that was submitted, I would guess, around May, June of this year, to OSD for their consideration in developing the next budget.

Senator SPECTER. But, your report was not submitted until we got it on June 29. It was not submitted until late June.

Dr. SIMMONS. It is possible—it certainly would have delayed the completion of the report to have taken into account a dramatically different set of cost inputs.

Senator SPECTER. In any event, Dr. Simmons, when you add it all up, the V–22 comes out at $7.7 billion, and the alternatives come out at $8 billion, even slightly higher, according to your conclusions.

Dr. SIMMONS. Yes, sir; again, the way we have structured the aircraft programs, that would be true. One of the factors that we took into account in doing that was the production rates that the contractors have proposed for the aircraft. A number of the alternatives that we looked at, the CH–53, the 60, the 47 are all aircraft in production today, and the production facilities have been built. The contractors have a good idea of the rate at which they could manufacture those aircraft.

We used in our assessment the rates that had been proposed by the contractor. We have also data from those contractors that showed that if we had slowed the rate for producing those aircraft, the cost would have increased. In the case of the V–22, the production facilities have not yet been designed or built, and we thought in that case, after detailed discussions with our cost analysis group at IDA, that it would be possible to specifically design the production facilities for a lower rate without incurring a substantial cost penalty, and that is the reason we elected to do that for the V–22 and not for the alternative. It would be possible to slow the alternatives, but we think at some increase in cost.

Dr. CHU. If I may, Senator, I think we are missing the point in this numerology. The key point that I am trying to stress and the Secretary's letter tried to stress, and the point I think Mr. Simmons' testimony highlighted as well, in his concluding paragraph, is that even in the so-called equal-cost alternatives in the IDA report, the investment cost of the V–22 alternative is higher than

that of the helicopter alternative. There is no way around that fundamental point. We can rearrange the helicopters, buy them faster, the V-22 slower, and make the dollars look the same in any given year or period. But in the end, the fundamental problem here is this is a $42 million-a-copy aircraft. The helicopters cost a lot less. Maybe they are going to cost more to operate, especially if you buy a lot more, but that is downstream.

Senator SPECTER. Dr. Simmons, is it not true that the cost to which Secretary Chu refers has been increased significantly because of DOD cancellations and changes in the requirements and requests?

Dr. SIMMONS. I guess I cannot answer that question in detail. I do not think, Senator, that the costs have increased substantially as a result of the cancellation. I think the Congress elected to continue the program last year and funds were provided for continued development of the aircraft. There may be some additional costs incurred as a result of it, but I am not sure. I would not say that they have been substantial.

Senator SPECTER. Dr. Simmons, when was your report delivered to the Department of Defense?

Dr. SIMMONS. I believe on Friday, June 23.

Dr. CHU. The 22nd was a Friday.

Senator SPECTER. Were the essential conclusions conveyed to the Department of Defense at an earlier stage?

Dr. SIMMONS. I guess a progress briefing that conveyed the essence of our conclusions were presented to the Department on April 16. We still had a considerable amount of work to do. The IDA Review Committee had suggested additional variations that they wanted the project team to consider. When we presented that progress briefing, the steering committee made additional suggestions. So over the 2 months, between April 16 and June 22, we spent that period doing the additional analysis and completing writing the report and drafting the briefing that we have shown you today.

Dr. RANDALL. If I might add to that, Senator Specter, I think I would characterize the briefing in April as what you might call a data dump. There were lots and lots of calculations, lots of bar charts. There were no slides in that briefing that were labeled findings or summaries. It did contain some emerging conclusions, but it was not a structured briefing of the sort you saw this morning. My recollection is that there were probably 150 charts in that presentation. So it really was a progress briefing, and not a presentation that would allow one to draw final conclusions.

Senator SPECTER. Well, there are a great many more questions which are still pending. We will keep the record open for submission of written questions.

ADDITIONAL COMMITTEE QUESTIONS

We will submit the balance of the questions for response for the record.

[The following questions were not asked at the hearing, but were submitted to the witnesses for response subsequent to the hearing:]

QUESTIONS SUBMITTED TO DR. SIMMONS BY SENATOR LAUTENBERG

V-22

Question: Dr. Simmons, you've stated in your testimony that the V-22 program would cost more in the near term than DoD has allocated for all of the services' assault aircraft programs through FY 97. however, isn't it also true that according to your study, the proposed DoD alternative aircraft program would in fact cost more than the V-22 program through FY 97?

Answer: Before addressing the costs of the alternative aircraft programs, it is important to describe the differences between the CH-60/CH-53E fleet that the Department of Defense substituted for the V-22 when that program was cancelled and the CH-60/CH-53E fleet examined in our assessment. While these two fleets are made up of comparable numbers of the same basic types of helicopters, there are several important distinctions. First, the CH-60 helicopter included in our fleet is one in which the fuselage has been lengthened or stretched so that the helicopter can carry more troops at once. By doing this, the number of CH-60s portion of the medium lift fleet lowered. However, modifying the CH-60 in this way does increase its near term cost. Second, we found that all of the alternative assault aircraft would benefit substantially if they were fitted with an avionics suite comparable to that planned for the V-22. In particular, the V-22 type avionics would make all of the alternatives more survivable by improving their ability to operate at night. Hence, the cost estimates that we have shown in the summary of our report for the CH-60/CH-53E fleet reflect the cost of adding more capable avionics to those helicopters. The option of using less capable avionics in all of the aircraft alternatives, including the V-22, was also examined in the study and the same relative rankings obtained for the alternative fleets. Finally, according to the contractor who builds the CH-53E helicopters for the Government, there has been a substantial increase in the costs for these aircraft. (Recall that the large CH-53E helicopters are needed to carry the loads that are too heavy for the smaller helicopters, such as the CH-60 that is included in the fleet that the Department substituted for the V-22, as well as the CH-46, the SUPER PUMA, and the EH-101). With these distinctions in mind, the following information is provided with regard to the cost differences among the alternative assault aircraft fleets.

As shown in our study report, we estimated that if the production rate for the V-22 were to be slowed to 36 aircraft per year (a production rate of approximately 48 for the aircraft per year had been planned when the V-22 program was cancelled), then the FY 1991-1997 costs for the V-22 program would amount to $7.7 billion (in constant FY 1988) dollars. The FY 91-97 costs for a CH-60 (Stretch)/CH-53E fleet comparable to the one that the Department of Defense substituted for the V-22 were estimated to total to $8.4 billion to $10.5 billion, depending on the rate at which aircraft were procured for special operations and search and rescue missions. Thus, according to our estimates, a helicopter fleet comparable to the one that the Department of Defense substituted for the V-22 would cost more than the V-22 provided that the production rate for the V-22 was slowed to at most 36 aircraft per year. If the V-22 aircraft were procured at the originally planned rate of 48 or more aircraft per year, then the FY 91-97 costs for the V-22 program would amount to $13.1 billion. Thus, at the high production rate, the V-22 program would cost more than a CH-60(Stretch)/CH-53E helicopter fleet over the FY 91-97 period.

In addition to affecting the cost of the V-22 program, slowing the production rate to 36 aircraft per year would affect the length of time needed to attain an operational capability. As is shown in our study report, slowing the production rate for the V-22 would delay the year that a brigade-size assault capability would be attained until 1998, 2 years later than would be the case at the higher production rate. At the production rates proposed for the CH-60(stretched)/CH-53E alternative, a brigade-size assault capability would be attained by 1996. The CH-47M fleet could attain such a capability by 1997. All of the other alternatives would do so in 1998 or later. The determination of whether unacceptable risks would be incurred as a result of these differences was considered beyond the scope of the study.

Question: Isn't it also true that, according to your study, every alternative to the V-22 you considered would cost more than the Defense Department has allocated for all the services' assault aircraft programs through FY 97?

Answer: According to the information provided to us by the Department of Defense in February 1990, a total of approximately $5.2 billion (in constant FY 1988 dollars) was allocated over the FY 91-97 period for the helicopter fleet that DoD substituted for the V-22 tilt rotor. Our estimates for the FY 91-97 costs for the alternative assault aircraft fleets that we examined in our study ranged from a low of $5.8 billion to a high of $13.1 billion. Thus, according to our estimates, all of the alternative assault aircraft fleets would cost more than the Department of Defense had allocated for such aircraft.

The most important factor underlying these differences is that the Department of Defense had allocated no funds to procure assault aircraft for either the Air Force's long-range special operations mission or for the Marine Corps' heavy lift mission. According to our estimates, the FY 91-97 costs for the special operations aircraft would amount to $0.7 billion to $1.5 billion while those for the heavy lift aircraft would amount to $1.1 billion to $1.7 billion. In both cases, the range of values reflects possible variations in the production rates for these aircraft. Had the Department of Defense included the costs for these aircraft in its estimate, then at least $1.8 billion would have had to have been added to the amount allocated for all services' assault aircraft programs, making for a total of $7.0 billion. This amount would have exceeded the near-term costs for the marinized version of the Army's CH-47 and for a new production helicopter and fallen about 10 percent short of the $7.7 billion required for the V-22 program at the slowed production rate.

The remaining differences between the funds allocated by DoD over the near term and the costs that we estimated for a comparable helicopter fleet can be explained by the three factors cited in our response to the previous question. First, the costs that we used for the CH-60 include the costs to stretch the fuselage of that helicopter so that it can carry more troops at once. Second, our estimates include the cost of fitting V-22 type avionics into all of the aircraft into all of the medium lift assault aircraft, since those avionics were found to make all of the aircraft more survivable by improving their ability to operate at night. Finally, the contractor who builds the CH-53E helicopters for the Government has substantially increased the price for those aircraft

Question: Dr. Simmons, in this new world we face, with the US planning on withdrawing significant forces from overseas, it seems critical that we preserve our ability to redeploy our forces quickly. One of the missions you looked at in your study was overseas deployment. Isn't it true that the V-22 tilt rotor is the only aircraft you studied which has the range and speed to self-deploy efficiently to an overseas combat theater?

Answer: The V-22's self-deployment range of over 2,200 nautical miles is substantially greater than that of any of the other alternative assault aircraft examined in our assessment. By comparison, the self-deployment range for the CH-46 helicopter is about 660 nautical miles, while that for the CH-47 is 950 nautical miles. The ranges for the other helicopter alternatives fall between these values. This consider range advantage, coupled with the V-22's 250 knot speed makes it possible to self-deploy these aircraft to overseas theaters. Even if it were possible to find a deployment route with legs compatible with the helicopters' shorter range, self-deploying helicopters would still be difficult. Because helicopters can fly only about half as fast as the V-22 tilt rotor, a helicopter would need twice as much time to cover the same distance, with adverse implications for both aircraft maintenance and crew fatigue. Thus, the standard method for deploying helicopters is to load them onto strategic airlift aircraft and fly them overseas. This method of deployment requires that the helicopters be partially disassembled first so that they will fit into aircraft like the C-141 or C-5. Once they reach their destination, the helicopters must be unloaded and reassembled before they can be used. As a result of this difference, our estimates show that the Marine Expeditionary Brigades that deploy in conjunction with the Navy's Marine Expeditionary Brigades that deploy in conjunction with the Navy's Maritime Prepositioned Ship Squadrons could reach their combat positions from 1.5 to 4.5 days earlier if equipped with V-22s. Whether or not this time difference would confer an operational advantage would, obviously, depend on the specific circumstances under which the forces were employed.

QUESTIONS SUBMITTED TO DR. SIMMONS BY SENATOR D'AMATO

Question: Dr. Simmons, you note in the executive overview of your study that "because the production facilities for the V-22 have not yet been built, they could be designed to accommodate a lower production rate than had been previously planned. Consequently, it should be possible to avoid the unit cost increases that occur when fixed overhead costs must be spread over a smaller production lot." Have you looked at different procurement strategies for the purpose of determining the optimal sizing of V-22 production facilities? (If not) Do you intend to? Do you have any sense of what sort of savings are achievable?

Answer: Our study does not attempt to determine the optimal production rate for the V-22. That task would require data at a considerably more detailed level than was needed to develop the cost estimates that are shown in your report. The statement quoted in the question above on the observation that since the production facilities for the V-22 have yet to be built, it should be possible to design them for a different production rate that had heretofore been assumed. Unlike the case with aircraft that are already in production lot,there would not be excess manufacturing capacity and therefore higher fixed costs that would have to be spread over a smaller production lot. Within some reasonable limits--which we would roughly estimate to be on the order of 24 to 36 aircraft per year (or 2 to 3 aircraft per month)--it should be possible to design an efficient production facility without incurring any significant increases in unit costs. In those cases where production facilities already exist--such as the H-60 and H-47--there is substantially less leeway in reducing the fixed costs associated with operating the production facility. Thus, when the production rate is reduced, those fixed costs must be spread over a smaller production quantity and unit costs increase.

Question: Dr. Simmons, one issue not touched upon by your study, at least in the executive overview, was the contribution made to task force survivability by the V-22's sizable advantage in range and endurance over present helicopters. Did your study group explore comparative losses of comparable task forces operating V-22s over-the-horizon versus operating CH-60s, CH-46s, and CH-53Es close to shore due to the "short legs" of the helicopters? (If not) Do you have any sense of the relative advantages or disadvantages accrued by a task force equipped with V-22s?

Answer: As part of our study, we explicitly examined how increasing the distance that the task force would stand off from the coast line could affect the ability of the ships to survive an attack by antiship missiles. Specifically, we looked at standoff distances of 25, 50, and 100 nautical miles. We found that increasing the standoff did, indeed, enhance the ability of the ships to survive such attacks. It is important to point out, however, that all of the aircraft alternatives that we examined would be capable of conducting assaults from even the farthest of these standoff distances. In the case of some of the alternatives, this required that the aircraft be modified so that it could carry extra fuel tanks. We assumed that such modifications would, in fact, be made and our estimates for the performance and cost of those aircraft reflect that assumption. Thus, in our assessment all of the alternatives would receive the survivability benefits that could accrue from increasing standoff.

QUESTIONS SUBMITTED TO DR. SIMMONS BY SENATOR SPECTER

Question: What is the manpower savings for the Marine Corps if they operate the V-22 rather than the CH-60/CH-53E Fleet?

Answer: At present, approximately 4,335 officers and enlisted personnel are assigned to the Marine Corps' active medium-lift helicopter squadrons. If the existing aircraft were to be replaced by the V-22 according to the plan initially proposed by the Marine Corps, about 5,050 officers and enlisted personnel would be needed in these units. If the existing aircraft were to be replaced by a CH-60/CH-53 fleet comparable to that proposed by the Department of Defense as a substitute for the V-22 and costing the same over 20 years as the proposed V-22 fleet (i.e., on the order of $33 billion or Cost Level I), approximately 8,050 officers and enlisted personnel would be needed to man the active aircraft squadrons.

If the existing aircraft were to be replaced using the numbers of V-22 aircraft that could be purchased and operated at Cost Level II (i.e., $24 billion over 20 years), then about 3,470 officers and enlisted personnel would be needed to man the Marine Corp's active medium-lift squadrons. Manning for an equal cost (20 year system costs) fleet of CH-60/CH-53 helicopters would total to 6,170 officers and enlisted personnel.

Thus, using the V-22 would mean that 3,000 fewer officers and enlisted personnel would be needed for the Marines' active medium-lift squadrons at Cost Level I ($33 billion) or that 2,700 fewer personnel would be needed at Cost Level II (24 billion). The costs associated with these different numbers of personnel are reflected in the operating and support costs estimated for the alternative assault aircraft fleets.

Question: What were your personal feelings and beliefs before, during, and after the study?

Answer: One of the lessons that I have learned during my career as a defense analyst is that it is best to approach each task with and open mind. Thus, when I was first asked to take on the V-22 study, my reaction was one of curiosity more than anything else. I had studied tilt-rotor aircraft in another context, and hence I was generally aware of their characteristics. Consequently, I was curious to see how well this type of aircraft would do when carrying out the various missions envisioned for the V-22

As the result emerged from the study, it became evident that for the set of missions that we examined, the V-22 had advantages over helicopters in most of these jobs if one were to spend the same amount of money over the long term. Those are the principal findings reported in our study and I continue to stand behind them today.

Question: What influence did the Office of the Secretary of Defense have on the study?

Answer: The Office of the Secretary of Defense asked IDA to perform the study and provided about half of the members of the Study's Steering Committee. All of the formal interactions between IDA and OSD were through this committee. The OSD representatives asked their share of questions and made their share of suggestions, but no time during the study did any member of the OSD staff attempt to push the results in any specific direction.

Question: What is "double-sling" and what impact did it have on the study conclusions?

Answer: The concept of double slinging involves using the CH-53E helicopters included in some of the alternative medium-lift assault aircraft fleets to carry two HMMWVs at a time. (It should be noted that all the assault aircraft fleets were assumed to include the planned force of CH-53E heavy-lift helicopters that carry the trucks and howitzers that are too heavy to be lifted by any of the other alternatives.) Carrying two HMMWVs at once is made possible by the CH-53's very large payload. The Marines have tested several devices that could be used to connect two HMMWVs together so that they would form a single, stable load under the helicopter. Although the tests show that this could be done, the Marines are concerned about the feasibility of hooking up the vehicles aboard a darkened ship at night and about disconnecting them in a landing zone that might be under fire by the enemy. In our study we looked at three different ways of loading the HMMWVs--all one at a time, all two at a time, and half one at a time and half two at a time. While this factor had some effect on the outcome, the difference was not substantial.

Question: Why did you run excursions with small HMMWVs, slower external load speeds for the V-22, and squad integrity and what were the results?

Answer: These were among the excursions and sensitivities that were suggested by the study's Steering Committee. To the extent that these suggestions had technical merit or seemed likely to affect the relative rankings of the alternative aircraft, IDA carried out analyses to investigate their effects.

SMALL HMMWV EXCURSION

Replacing the Marines' existing HMMWV with a smaller vehicle would eliminate the need to use large CH-53E helicopters for medium lift and thus could potentially enhance the cost-effectiveness of some of the alternative helicopter fleets when conducting the amphibious assault mission. The results of the analysis, in fact, showed this to be the case. However, even with a smaller HMMWV, the V-22 and New Helicopter fleets still tended to fare better overall than the other alternatives.

For the other Marine missions, sizing the assault aircraft fleet around a small HMMWV had no significant effect on the relative ranking of the alternatives. These results are reported in our study. However, we were unable to examine the effect that using the small HMMWV would have on ground combat or to assess the costs that would be incurred to develop, man, and operate a fleet of such vehicles.

SLOWER SPEED EXCURSION

Although actual flight tests with a HMMWV carried under a V-22 have yet to be conducted, wind tunnel tests conducted with scale models of the aircraft and the HMMWV suggest that the aircraft-HMMWV combination would be aerodynamically stable at speeds over 200 knots. Performance predictions also indicate that the V-22 would have enough power to carry a HMMWV at those speeds. There is some concern, however, whether the vehicle might be damaged in some way by being carried at such speeds. (HMMWVs are frequently carried by helicopters at speeds of 130 to 140 knots without damage.) Wind tunnel tests with the HMMWV could show if it could tolerate higher speeds and if simple fixes like tie down straps could keep the hood, for example, from coming loose or flying off.

One of the reasons that the V-22 looks more attractive than helicopters is that it can fly faster. As a consequence, a single V-22 can deliver more loads in a fixed interval of time than can a slower-flying helicopter. Thus, fewer V-22s are required to carry the same total amount of equipment ashore. To determine whether these results would be affected by the speed at which the aircraft

carried external loads, we conducted a sensitivity analysis to see what would happen if the V-22 were to fly at the same speed as a helicopter when carrying a HMMWV externally. We found that because the V-22 would still be able to fly the return leg of each trip at its normal speed of 250 knots and because many sorties did not require HMMWVs to be carried, this change had very little effect.

SQUAD INTEGRITY EXCURSION

The Marines' standard, reinforced rifle squad contains approximately 24 troops. For tactical reasons, the Marines would prefer to load an entire squad into a single aircraft and deliver it to the landing zone. This can be accomplished with the V-22, the CH-47, the New Helicopter, and the CH-53E. It cannot be done with any of the four smaller helicopters. If one of those aircraft were to be used, rifle squads would have to be broken up and carried ashore in two (or more) aircraft. Squads would also have to be broken up if full use were to be made of the capacity of the CH-47 (42 troops) or the CH-53E (35 troops).

In our analysis we were not able to account explicitly for the potential effects of landing rifle squads in less than complete tactical units. Instead, we calculated the rate at which the entire Marine vertical assault force could be landed. Among the cases that we examined were ones in which aircraft was loaded to its full capacity, as determined by the distance at which the assault was being conducted (e.g., 25, 50, or 100 nautical miles) and by the prevailing environmental conditions. In other cases, the troops loads of the larger aircraft were limited to the 24 combat-equipped troops that the Marine propose to carry in the aircraft. In general, we found that the productivity benefits that result from carrying larger loads were negated when aircraft survivability was taken into account. That is, loading more troops onto each aircraft meant that more would be lost when an aircraft was downed.

Question: According to your report, you feel that your assumptions were conservative with respect to the V-22. Were you likewise conservative with respect to the helicopters, and what difference would it make in your conclusions if you had assumed more realistic data on all aircraft?

Answer: We tried to be intentionally conservative in estimating the reliability characteristics and the operating and support costs of the new design aircraft--whether tilt rotor or helicopter. Because there is no substantial operating experience upon which to base estimates for the performance or cost of these aircraft, it seemed advisable to adopt such an approach. Based on past experience, we were aware that the reliability and maintainability--and hence the attendant operating and support cost savings--of many defense systems have been overstated. We tried to account for that possibility here.

In particular, the V-22 tilt rotor, the New Helicopter, the EH-101, and the SUPER PUMA are all to be equipped with maintenance monitoring systems and built-in test equipment that are projected to simplify maintenance and reduce operating costs. In our assessment we did not credit any of these aircraft with such savings. Had we done so, each of these alternatives would have looked somewhat more attractive than our results show.

Question: An Office of the the Secretary of Defense spokesman has indicated that your Operation & Support costs for the V-22 were optimistic. In your report you show NAVAIR (Navy Air Command) estimates compared to your own. If you had used the NAVAIR estimates, what effect would it have had on your conclusions?

Answer: As noted above, IDA was intentionally conservative in its estimates of the reliability characteristics and the operating and support costs of the newest design aircraft--whether the V-22 tilt rotor or one of the most recently designed helicopters. This

approach seemed particularly advisable since there is no substantial operating experience upon which to base estimates for the performance or cost of these aircraft as is the case with the other four alternatives, models of which are all in use today Based on past experience, we were aware that the reliability and maintainability-- and hence the potential for reducing operating and support costs--of many defense systems have been overstated. We tried explicitly to account for that possibility here. Thus, we believe the study used conservative assumptions on O&S costs, not optimistic ones.

In particular, in our assessment we did not credit any of the new design aircraft with the cost savings that have been projected to result from the maintenance monitoring systems and built-in test equipment that have been included in their designs. The V-22 tilt rotor, the New Helicopter, the British-Italian EH-101, and the French SUPER PUMA would all be equipped with such systems.

The cost estimates prepared by the Naval Air Systems Command, on the other hand, tried explicitly to take these factors into account. Thus, while NAVAIR's estimates for the O&S costs for the CH-53E and CH-60 were about 20 percent lower than ours, their estimate for the operating and support costs for the V-22 was about 40 percent lower than ours.

Had we used the NAVAIR O&S cost estimates for these aircraft, the V-22 fleet would have looked somewhat more attractive than shown by our results.

Question: Would you describe the composition of the IDA study team, comment briefly on the individual qualifications of your team members and summarize your own background?

Answer: Including myself, the IDA study team for the V-22 assessment consisted of 21 IDA research staff members and consultants. (IDA often makes use of consultants with specialized knowledge in subject areas where it would be impractical to retain full time employees.) The study team was divided into four principal groups: one concentrating on scenarios, threats, and concepts for employing the alternative aircraft; one focusing on the characteristics and flight performance of the alternative aircraft; one dealing with aircraft costs; and one concerned with estimating the potential combat effectiveness of the alternatives.

The latter two assessments constituted the bulk of the work on the study and were carried out almost exclusively by full-time members of IDA's research staff. The specific individuals who participated in the study are identified on the title page of the study report. Their qualifications are summarized briefly below.

The scenario task team was headed by a retired Marine Corps Major General, who has served as a consultant to IDA on a number of different projects. He was assisted on this task by a retired Navy Rear Admiral and a retired Air Force Major General, both of whom are also consultants to IDA. By drawing on their own considerable military experience, these three senior officers helped ensure that our scenarios and operational concepts were militarily realistic. They also provided valuable assistance in identifying appropriate information sources within the military services. Their efforts were aided by those of another consultant who drew on his previous Army and Defense Intelligence Agency experience to assist in identifying the characteristics of potential threat systems. One member of the IDA staff was also assigned to the scenario task team.

The aircraft characteristics and performance assessment was led by an IDA consultant with considerable experience in the design and testing of both helicopters and tilt-rotor aircraft. He was aided by three other task team members who hold advanced degrees in aeronautical engineering. All are consultants to IDA and have assisted us in investigations of other advanced aircraft systems in the recent past. The aircraft characteristics team also

included a recognized expert in the design and evaluation of naval vessels, who applied his extensive knowledge to the assessment of ship-aircraft interfaces.

The cost assessment team was headed by one of the IDA research staff. Two other analysts from IDA's Cost Analysis Research Division assisted on this task. These IDA employees each had substantial experience in estimating the costs of advanced rotory-wing aircraft systems as a result of their extensive involvement with the Army's Light Helicopter Program.

The effectiveness assessment team was made up of six members of the IDA research staff and one consultant. Briefly stated, the qualifications of these team members were as follows: one held a Masters in Operations Research from the Naval Postgraduate School, was a retired Navy combat pilot, and had over 10 years experience in defense analysis; one held a PhD in Physics from the California Institute of Technology and had experience in antisubmarine warfare assessments, which he applied to the evaluation of the SV-22; one held a PhD in Aeronautics and Astronautics from the Massachusetts Institute of Technology, which expertise was used in the survivability assessment; one held a Masters in Aeronautical Engineering from Rensselaer Polytechnic Institute; one held a PhD in Physics from the University of Rochester and over 20 years experience in defense analysis, all concerned primarily with aircraft systems; and one held a PhD in Physics from the Massachusetts Institute of Technology and had just over 5 years experience in defense analysis. The only consultant on this task team held a Masters in Antisubmarine Warfare Systems Technology from the Naval Postgraduate School, which knowledge was applied in our assessment of the SV-22.

My own background includes a Masters Degree in Operations Research and a PhD in Physics, both from Purdue University, and over 15 years experience in defense analysis. During that period I have authored or directed over 35 major assessments of military systems, including IDA'S Independent Assessment of Alternative Light Helicopter Technologies, conducted during 1987.

QUESTION SUBMITTED TO DR. CHU BY SENATOR D'AMATO

V-22

Question: Dr. Chu, in a memorandum dated January 16, 1984, you argued that 'there is no question that if the JVX (the then current designation of V-22) airframe lives up to its potential, it could have significant applications to many more missions than those for which it is currently being developed." You cite 26 missions the JVX could fulfill in addition to the 6 for which the JVX was then being developed. If, as you have argued in the past, the V-22 is filling too narrow a mission, isn't that a reflection of OSD's inability to hold the Army, Air Force, and Navy to the JVX MOU dated June 4, 1982? Aren't we really discussing the limitation of OSD's ability squash service parochialism, to save money and avoid redundancy by developing joint programs? Considering this failure on the part of OSD, how confident can we be about future joint programs, specifically the Advanced Tactical Aircraft (ATA) and the Advanced Tactical Fighter (ATF)? Couldn't the 'narrow mission' argument be applied to the ATA now that the Major Aircraft Review has pushed Air Force procurement of the ATA beyond 1997?

Answer: The purpose of joint programs is to allow the military services to save money by sharing the development costs of a common program and to realize procurement cost savings through larger production quantities. All joint programs must be judged on their own merits by the participants: it is appropriate for a service to drop out if its participation no longer offers the best solution. The cancellation of the V-22 should have no effect on the other joint programs you have mentioned.

QUESTIONS SUBMITTED TO DR. CHU BY SENATOR SPECTER

1989 V-22 DECISION

Question: What analysis did you use to support your recommendation to cancel the V-22 program last year?

Answer: I have attached two cost tables that were used last year in Secretary Cheney's decision to cancel the V-22 program. Table 1 shows the cost of the V-22 and alternative aircraft mixes (CH-53E/CH-60) in discounted FY 1988 constant dollars, while Table 2 makes the same comparisons using FY 1988 constant dollars. The tables compare two production strategies for the V-22--dual sourcing and coproduction--with two CH-53E/CH-60 mixes that provide equal lift capability under alternative assumptions about HMMWV carriage. On a constant-dollar basis (Table 2), the two V-22 costs fall between the costs of the two CH53/CH-60 mixes: they are lower than the costs of the single-sling option but higher than the dual-sling costs. On a discounted cost basis (Table 1), both V-22 alternatives are more expensive than either CH-53E/CH-60 alternative. In the dual-sling case, the V-22 is roughly 50 percent more costly over a projected 20-year system lifetime.

Table 1.
Comparison of V-22 Alternatives
(Discounted Constant FY 1988 Dollars in Millions)

Alternative	RDT&E	Proc	O&S a/	Total
V-22 (602 aircraft)				
-- NTE & Dual Source	382	9602	2045	12029
-- Adjusted NTE & Coproduction	382	11299	2044	13725
Terminate V-22/Buy Alternative Aircraft Mix - Single Sling				
- CH-53E (376 aircraft)	-	3506 b/	2150	
- CH-60/HH-60 (590 aircraft)	143	3132	1489	
- Total	143	6638	3639	10420
Terminate V-22/Buy Alternative Aircraft Mix - Double Sling				
- CH-53E (225 aircraft)	-	2694 b/	1506	
- CH-60/HH-60 (478 aircraft)	143	2775	1297	
- Total	143	5469	2803	8415

a/ O&S Costs include phase in costs and 20 year steady state costs.

b/ During the budget adjustment deliberation, an extra $216M (discounted constant FY 88 $) was added to the CH-53E (FY 90-94) to achieve more robust support and spares funding. The adjusted totals for the single sling option and the double sling option should be $10,636M and $8,631M, respectively.

Table 2.
Comparison of V-22 Alternatives
(FY 1988 Constant Dollars in Millions)

Alternative	RDT&E	Proc	O&S a/	Total
V-22 (602 aircraft)				
-- NTE & Dual Source	428	16185	10502	27115
-- Adjusted NTE & Coproduction	428	19875	10500	30803
Terminate V-22/Buy Alternative Aircraft Mix - Single Sling				
- CH-53E (376 aircraft)	-	6998 b/	11187	
- CH-60/HH-60 (590 aircraft)	167	7192	8588	
- Total	167	14190	19775	34132
Terminate V-22/Buy Alternative Aircraft Mix - Double Sling				
- CH-53E (225 aircraft)	-	4188 b/	6207	
- CH-60/HH-60 (478 aircraft)	167	5827	7025	
- Total	167	10015	13232	23414

a/ O&S Costs include phase in costs and 20 year steady state costs.

b/ During the budget adjustment deliberations, an extra $257M (constant FY 88 $) was added to the CH-53E (FY 90-94) to achieve more robust support and spares funding. This amount is not reflected in the cost shown here. The adjusted totals for the single sling and the double sling options should be $34,389M and $23,671M, respectively.

V-22

Question: Over the past eight years there has been a number of studies comparing V-22 and alternatives to satisfy the V-22 Joint Service Operational Requirement. Could you please briefly describe the results of these studies? Could you also please comment on the fact that prior to Secretary Cheney's tenure three Secretaries of Defense, four Secretaries of the Navy, and two Marine Commandants recommended moving forward with the V-22 program?

Answer: Will be provided to the Committee in the near future.

OTHER V-22 STUDIES

Question: Over the past eight years there have been a number of studies comparing V-22 and alternatives to satisfy the V-22 Joint Service Operational Requirement. Could you please briefly describe the results of these studies? Could you also please

comment on the fact that prior to Secretary Cheney's tenure three Secretaries of Defense, four Secretaries of the Navy, and two Marine Commandants recommended moving forward with the V-22 program?

Answer: During the past eight years, there have been ten studies of the V-22, including four that addressed Marine Corps missions.

The first was the Joint Technical Assessment (JTA), completed in June 1982. That study was conducted by the four services and the National Aeronautical and Space Administration (NASA), under the Army's lead. The JTA reviewed existing and advanced rotorcraft technologies in an effort to determine which best satisfied the Joint Service Operational Requirement (JSOR). The JTA concluded that tilt-rotor technology offered the greatest potential for a common multiservice, multipurpose aircraft.

The second study was the "Department of the Navy Long-Term Amphibious Lift Requirement and Optimum Ship Mix Study," or DON Lift I. That analysis identified future requirements for amphibious ships as well as for medium- and heavy-lift aircraft.

The third study, conducted by the Center for Naval Analyses (CNA), was titled "Cost and Operational Effectiveness Analysis of JVX for the Marine Corps Assault Mission." That study, commonly called the JVX COEA, found the JVX (now V-22) to be "the most operationally effective candidate, though not the least costly." The study deemed the JVX "both more effective and less costly than the UH-60 alternative." Relative to a notional new helicopter, the JVX was judged to be more effective but also more expensive, by as much as $2 billion. The study said subjective judgment would be required "to weigh the additional capabilities of the JVX against its additional cost." In the memorandum transmitting the study (dated March 25, 1986), the Commandant of the Marine Corps noted: "Because of the limited scope of the analysis, the report is provided for information purposes only."

The fourth study, also conducted by CNA, was titled "An Evaluation of the JVX Aircraft for Combat Search and Rescue." That analysis, completed in March 1985, found the V-22 to be more operationally effective than the HH-60A (the other system under investigation) for naval search-and-rescue missions.

The fifth study, called "Cost and Operational Effectiveness Analysis of the CV-22 (JVX) for the Airlift of Special Operations Forces (SOF)," was conducted by the Air Force in December 1984 and revised in December 1986. That analysis compared the V-22 against the HH-53E. It concluded that a SOF aircraft fleet built around the V-22 would be more effective and have a lower life-cycle cost than one centered on the HH-53E.

The sixth study was a cost-effectiveness analysis of the SV-22 conducted by CNA in March 1988. That study compared the SV-22 with the S-3X in terms of their potential contribution to antisubmarine warfare (ASW) operations. It concluded that the requirement to develop a suitable ASW sensor took priority over employment of either platform in the outer ASW screen. In terms of capability, the study judged the S-3, with improved sensors, to be the better choice for carrier-based operations. In support of that finding, the study noted that, in order to be comparable to the S-3 in maintaining aircraft on-station at distances of 250 nautical miles, the SV-22 would have to be staged off surface combatants at distant locations. This would require costly ship modifications and would interfere and compete with LAMPS helicopter operations and support (fuel, weapons, etc.).

The seventh study, by the Naval Air Development Center, is known as "The Acoustical Screening Study." That analysis, completed in July 1988, concluded that the SV-22, with an advanced avionics suite, would add significant multimission capability to noncarrier battle groups.

The eighth study was an Army analysis, "U.S. Army Airlift Requirements Study (Prerequisite for V-22 Tilt-Rotor COEA)." It was conducted jointly by the Army Training and Doctrine Command and the Army Aviation Center. The final report, dated February 1989, determined that the V-22 offers benefits for medical evacuation and SOF missions that cannot be achieved using current aircraft. The study also found the V-22 to provide unique capabilities for corps cargo and troop transport missions.

The ninth study, by the Department of the Navy, is titled "Integrated Amphibious Operations and USMC Air Support Requirements." It was forwarded under a memorandum signed April 6, 1990, by the Secretary of the Navy, and is commonly referred to as DON Lift II. The study expresses lift requirements in terms of CH-60s and CH-53Es--the aircraft selected for procurement in lieu of the V-22. The study does not compare those aircraft with the V-22 or with any other system. Recommendation Three in the study does, however, call for the Secretary of the Navy to "explore alternatives for the CH-60/CH-53E helicopter mix in the ship-to-shore movement."

The tenth study is the IDA study you were briefed on here today.

Recommendations to move forward with the V-22 that were made before Secretary Cheney's tenure were advanced with the expectation of greater availability of resources than has proven to be the case.

HMMWV

Question: Can you please explain the rationale behind assuming CH-53Es could be used more effectively if a smaller HMMWV were slung underneath it in a double sling configuration?

Answer: The IDA study considered dual-sling and smaller HMMWVs as separate options, not jointly.

Dual-slinging makes more efficient use of helicopter assets in fleets that use large aircraft. The CH-53E and the CH-47 are the only aircraft IDA studied that are capable of carrying two HMMWVs at a time. Dual-slinging would thus reduce by half the number of these aircraft needed to carry the same number of HMMWVs in the same amount of time.

A small HMMWV would allow more efficient use of resources for all aircraft alternatives. The current vehicle poses problems for all of the candidate aircraft because it is too wide to fit inside any of them and too heavy for some of them to carry at all. Larger aircraft like the V-22, CH-47, and CH-53 could carry a smaller HMMWV internally with additional troops, which would be both a more efficient and more survivable configuration. Alternatively, one could dramatically reduce the number of CH-53Es (for those alternatives that use this aircraft for medium-lift missions) by procuring a HMMWV that one of the smaller aircraft could carry, thereby expanding the role of the smaller helicopters and largely limiting the CH-53E to the heavy-lift missions for which it was designed.

CONCLUSION OF HEARING

Senator SPECTER. We are now up to the 3-hour mark with the hearing. So, I think we ought to conclude at this juncture.

The subcommittee thanks the witnesses, Secretary Chu, Dr. Simmons, Dr. Randall, for coming here today. It is very helpful to have this direct comparison to assist the committee and subcommittee in coming to our conclusions. So, the subcommittee will now stand in recess subject to the call of the Chair. Thank you very much.

[Whereupon, at 11:56 a.m., Thursday, July 19, the hearing was concluded, and the subcommittee was recessed, to reconvene subject to the call of the Chair.]

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